CONTENTS

FT-747GX TECHNICAL SUPPLEMENT

This manual is intended to serve as a supplement to the FT-747GX Operating Manual. Detailed information regarding functions, installation, interconnections and operation has been provided in the Operating Manual, and is not reprinted herein. Therefore, this supplement is not intended to serve as an independent reference, but to be used in conjunction with the information provided in the Operating Manual.

Because there are nearly two hundred and fifty semiconductor devices in the FT-747GX, circuit description information is provided in the form of numerous block diagrams. We hope that this manner of providing functional information proves to be more convenient for the owner and technician than would a lengthy verbal description. Those readers unfamiliar with the basic types of analog and digital circuits that serve as the building blocks of the FT-747GX are encouraged to study instructional material, such as that provided in handbooks on amateur radio and digital circuit design, before attempting to understand the design of the FT-747GX. Each block in the block diagrams represents one such basic circuit. General information on integrated circuits and their applications is available in the data provided by the IC manufacturers. Specific circuit details are provided in the schematic diagrams in this manual.

While we believe the technical information in this manual is correct, Yaesu assumes no liability for damage that may occur as a result of typographical or other errors that may be present. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

Yaesu Musen reserves the right to make changes in the circuitry of this transceiver, in the interest of technological improvement, without obligation to notify owners or to modify any sets produced prior to the modification.

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Figure 2.
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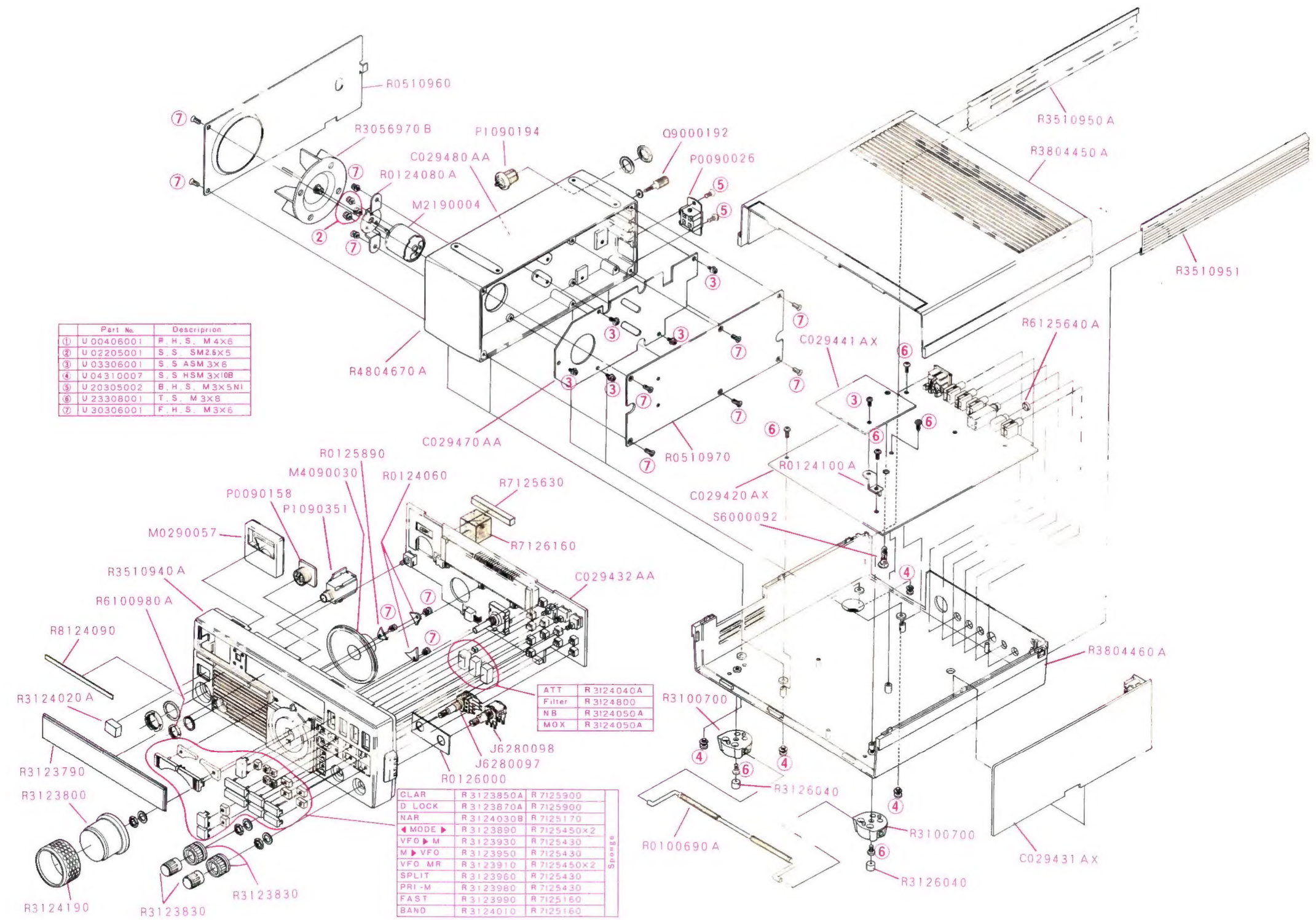
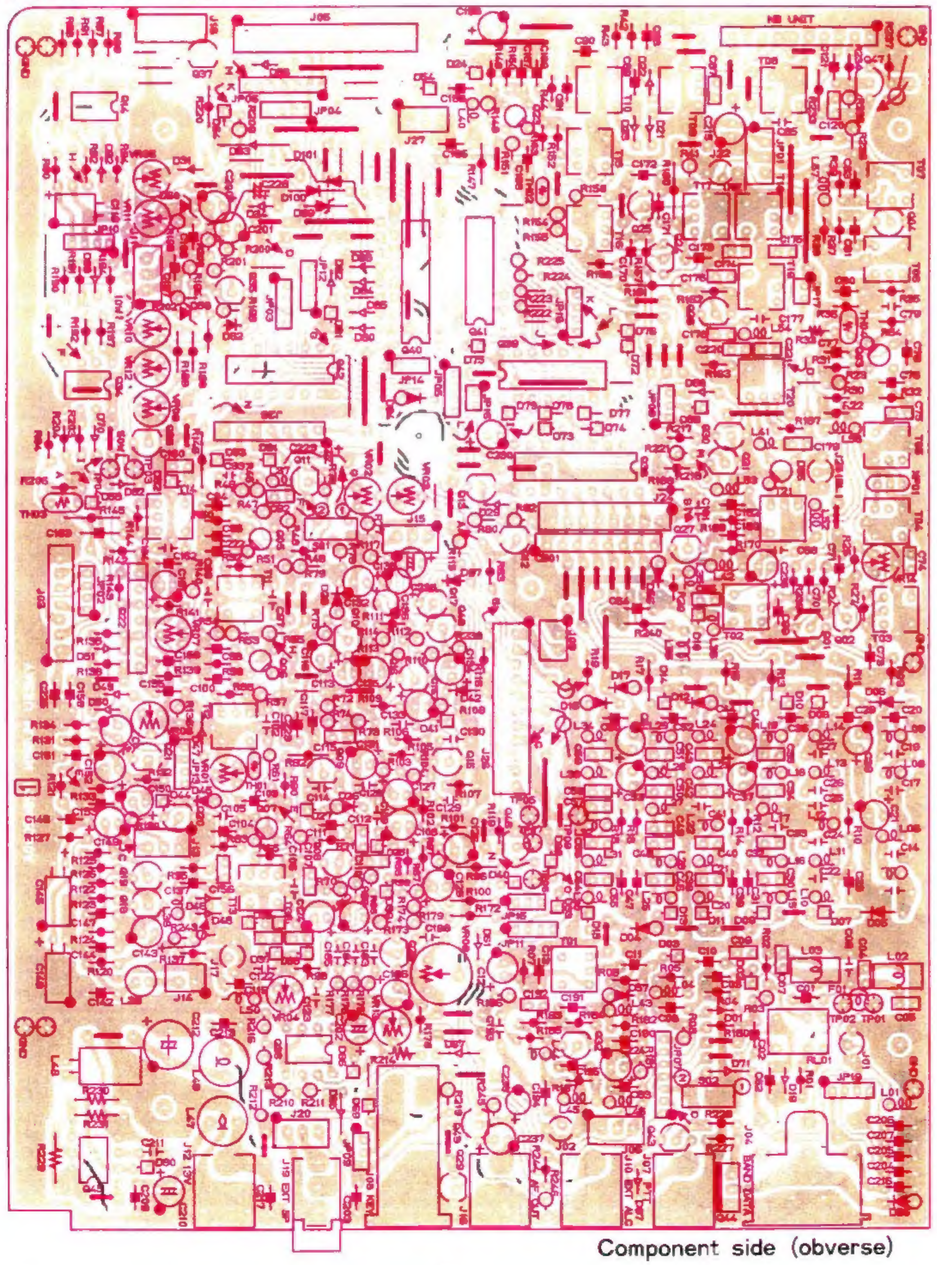


	Part No.	Description
①	U00406001	P.H.S. M4X6
②	U02205001	S.S. SM2.5X5
③	U03306001	S.S ASM 3X6
④	U04310007	S.S HSM 3X10B
⑤	U20305002	B.H.S. M3X5NI
⑥	U23308001	T.S. M3X8
⑦	U30306001	F.H.S. M3X6

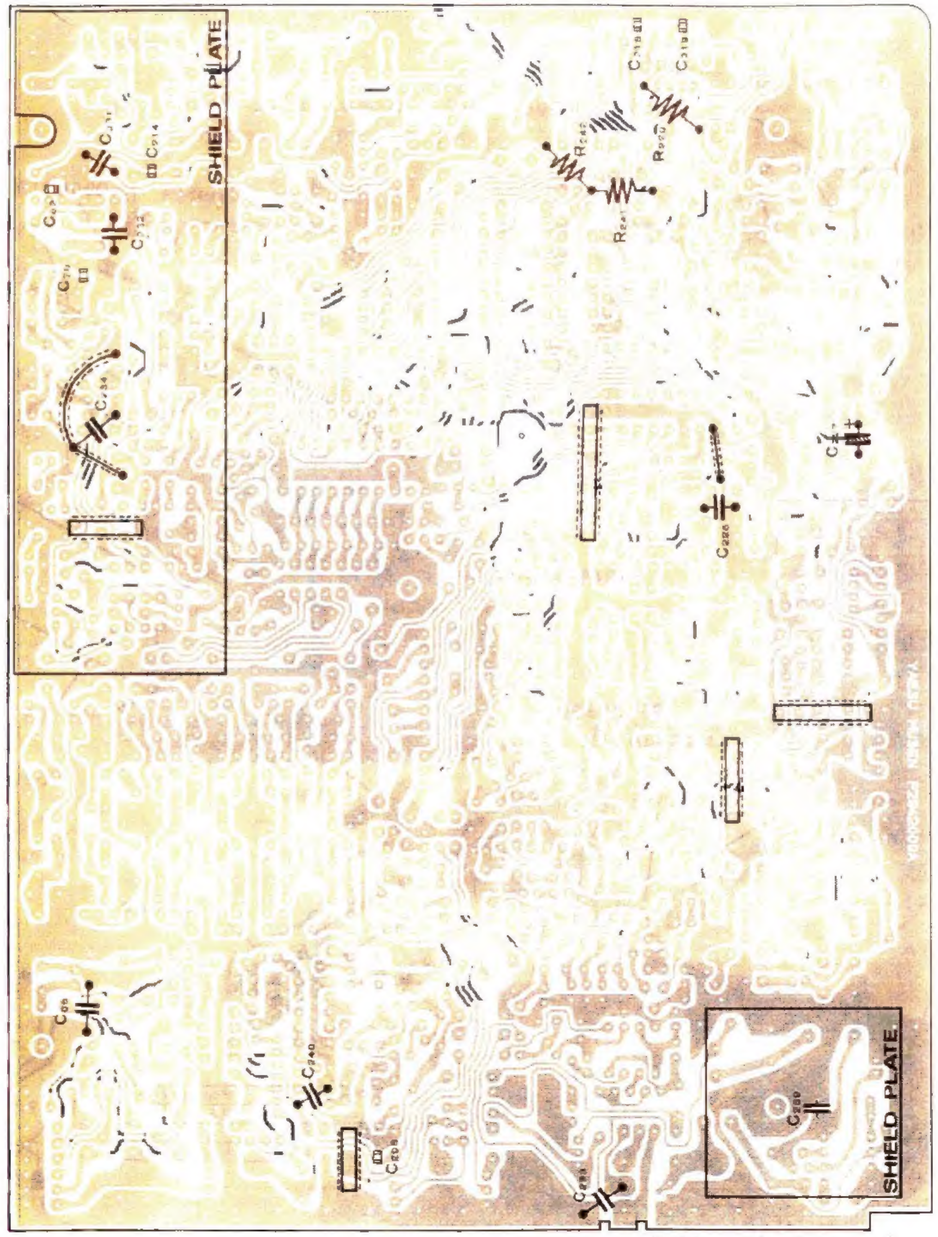
ATT	R3124040A	
Filter	R3124800	
NB	R3124050A	
MOX	R3124050A	

CLAR	R3123850A	R7125900	Sponge
D LOCK	R3123870A	R7125900	
NAR	R3124030B	R7125170	
◀ MODE ▶	R3123890	R7125450×2	
VFO ▶ M	R3123930	R7125430	
M ▶ VFO	R3123950	R7125430	
VFO MR	R3123910	R7125450×2	
SPLIT	R3123960	R7125430	
PRI-M	R3123980	R7125430	
FAST	R3123990	R7125160	
BAND	R3124010	R7125160	

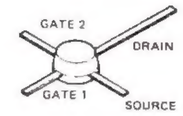
PARTS LAYOUT



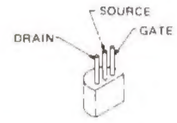
Component side (obverse)



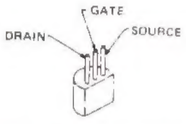
Solder side (obverse)



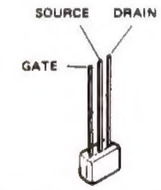
3SK74L (Q1003, 1005~1007, 1023



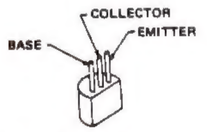
2SK104J (Q1010)



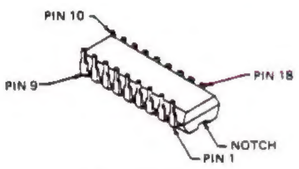
2SK125 (Q1001,1002, 1027



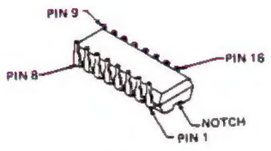
2SK192AGR (Q1011)
2SK241GR (Q1004,1024, 1025



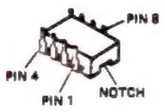
2SA733AP (Q1012)
2SC458B (Q1008,1009, 1015,1016, 1018,1019, 1021,1028, 1047,1049
2SC458BTZ (Q1035)
2SC535B (Q1026)
2SC2053 (Q1032)



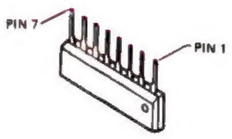
M54563P (Q1038)
M54564P (Q1040)



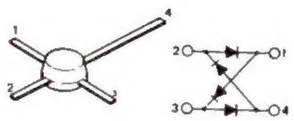
μPD4028BC (Q1039)
μPD4094BC (Q1041,1042)



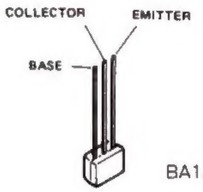
IR3M03A (Q1045)
M5218P (Q1014,1034)
M5223P (Q1036)



μPC1037H (Q1022)



ND487C2-3R (D1055)



BA1A4M (Q1013,1020,1029,1030, 1033,1037,1046
BA1L3Z (Q1017,1048)
DTA143ES (Q1031,1043)

2SD669A (Q1044)

DRAIN
SOURCE

003,
005~1007,
023)

OURCE
GATE

010)

GATE
SOURCE

001,1002,
027)

DRAIN

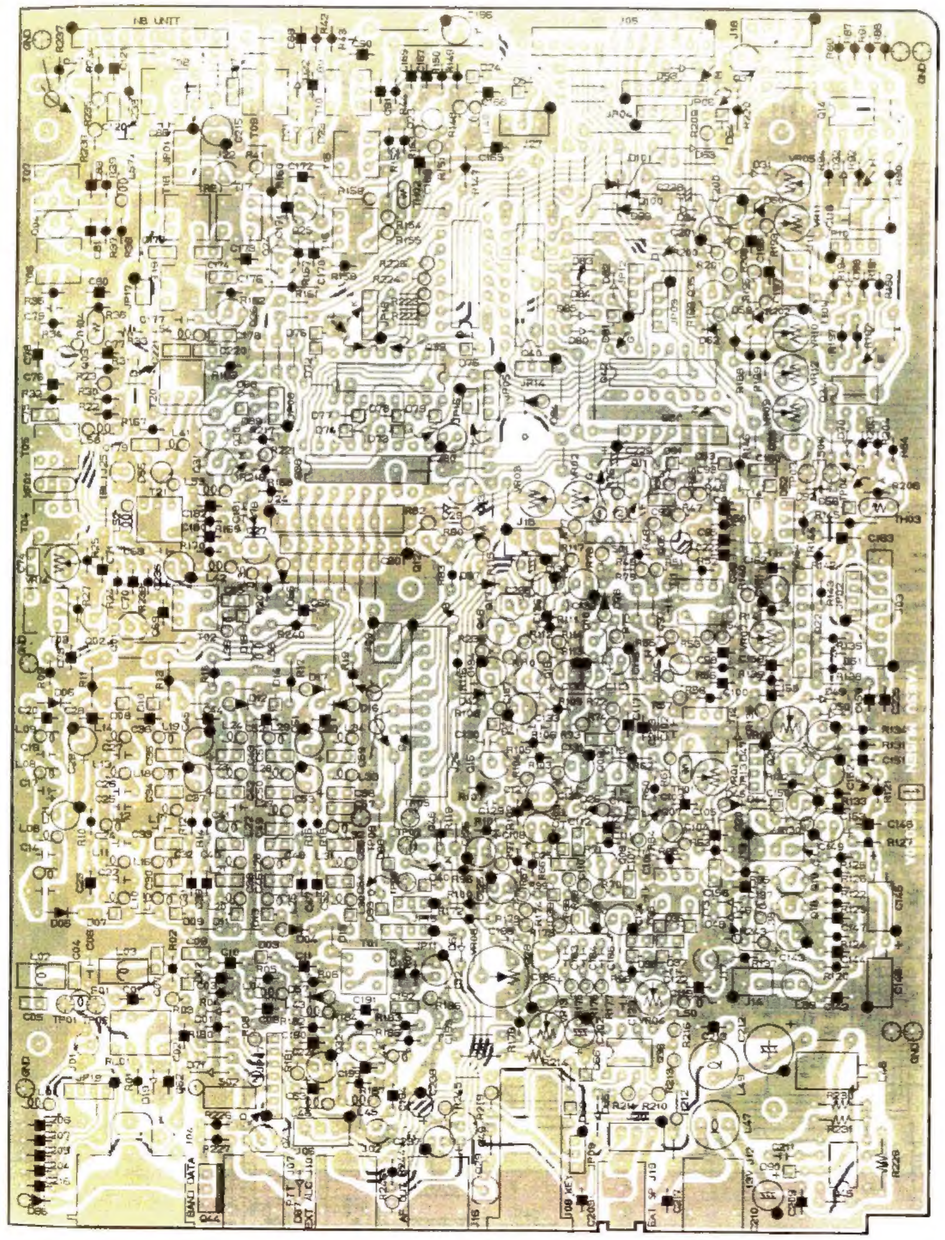
(Q1011)
Q1004,1024,
1025)

COLLECTOR
EMITTER

1012)
1008,1009,
1015,1016,
1018,1019,
1021,1028,
1047,1049)
Q1035)
026)
032)

COLLECTOR

044)



Component side (reverse)

MAIN UNIT VOLTAGE CHART

(DC VOLT)

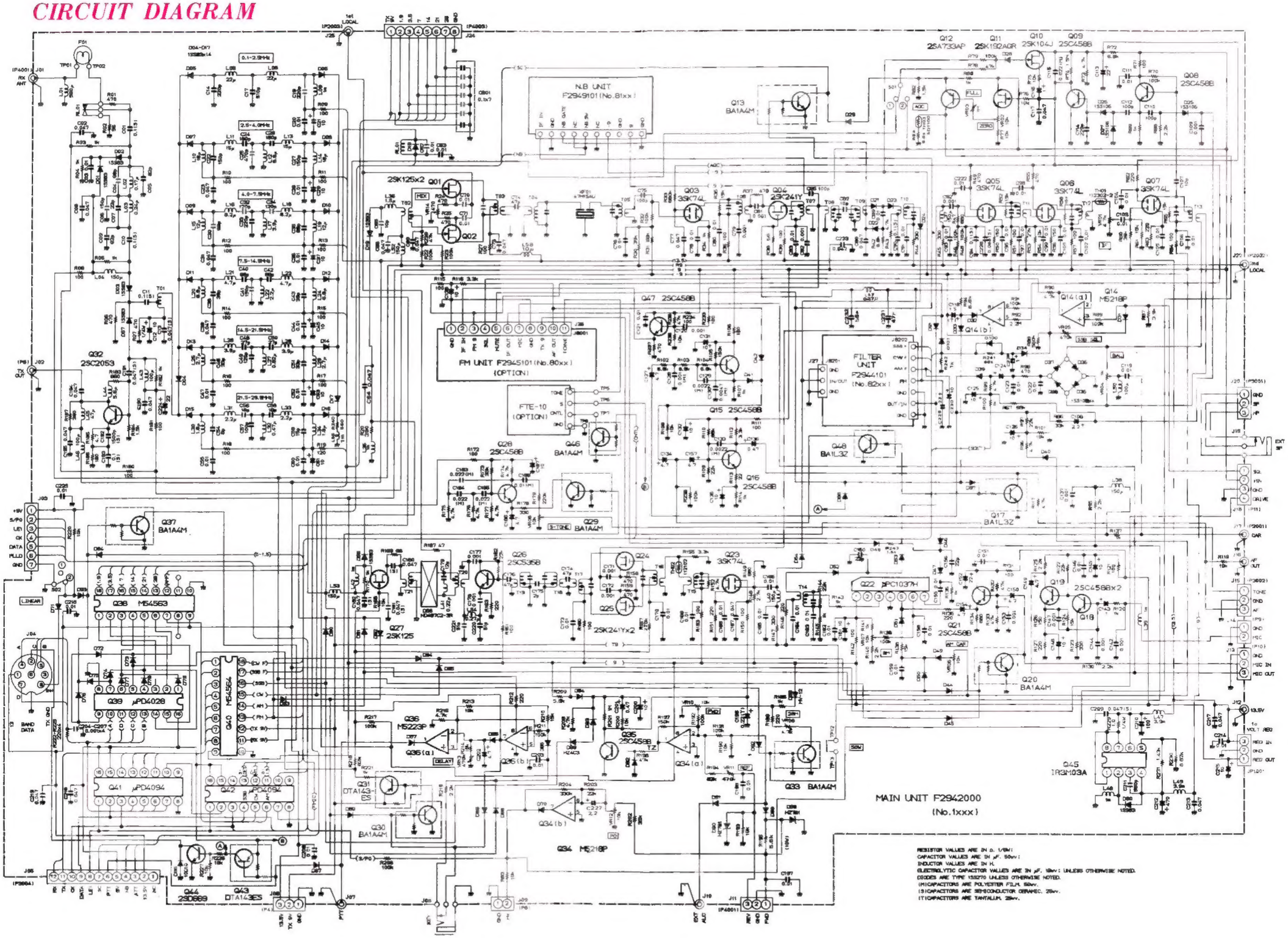
	E (S)	C (D)	B (G_1)	(G_2)	REMARKS
Q1001	2.5/-0.1	12.7/13.4	-0.7/-5.1		RX/TX
Q1002	2.5/-0.1	12.7/13.4	-0.7/-5.1		RX/TX
Q1003	2.0/0	13.2/13.4	1.5/-4.1	3.2/3.2	RX/TX
Q1004	0.6	13.4	0		
Q1005	1.7/0	7.8/8.8	1.7/-4.0	3.4/3.4	RX/TX
Q1006	2.2	7.4	2.4	3.4	
Q1007	1.9	8.0	1.8	3.6	
Q1008	4.8	8.3	5.5		
Q1009	0	3.4	0.1		
Q1010	3.6	3.6	0		
Q1011	6.2	8.8	3.4		
Q1012	5.3/0.7	0/0	4.7/4.6		RX/TX
Q1013	0/0	5.0/0.1	0/4.3		RX/TX
Q1015	4.2	8.4	4.8		
Q1016	1.3	4.4	2.0		
Q1017	0/0	0/0	0.1/3.7		RX/TX
Q1018	0.1	1.4	0.7		
Q1019	0.8	4.2	1.4		
Q1020	0/0	0/0	7.0/0		RX/TX
Q1021	3.0	8.4	3.6		
Q1023	1.9	0	1.8	3.2	
Q1024	0/0.6	8.9/8.6	-3.9/0.1		RX/TX
Q1025	0/0.6	8.9/8.6	-3.9/0.1		RX/TX
Q1026	3.0	7.5	3.8		
Q1027	0/1.6	-4.0/0.1	0/6.9		RX/TX
Q1028	0.6(0.3/0.6)	7.7(7.7/3.7)	1.0(1.0/0.9)		RX CW(TX CW KEY UP/DWN)
Q1029	0(0/0)	0.6(0.6/0)	0(0/11.0)		RX CW(TX CW KEY UP/DWN)
Q1030	0(0/0)	0(7.5/0)	0(0/10.5)		RX CW(TX CW KEY UP/DWN)
Q1031	0(7.5/7.5)	0(-0.5/7.5)	0(7.5/0)		RX CW(TX CW KEY UP/DWN)
Q1032	8.1	13.2	8.8		
Q1033	0	6.9	0		
Q1035	0	3.1	-0.5		
Q1037	0/0	0.5/7.4	4.0/0		0.5~1.5, 14.5~18.5 / 21.5~25.0MHz / other
Q1043	5.5/5.0	0/5.0	5.0/0.6		RX/TX
Q1044	0/0	0.6/0	0/0.6		RX/TX
Q1046	0/0	0.4/0	0/4.8		RX/TX (MODE FM, SPLIT ON)
Q1047	0.8	8.7	1.5		
Q1048	0/0	0/0	0.1/3.7		RX/TX

MAIN UNIT IC VOLTAGE CHART

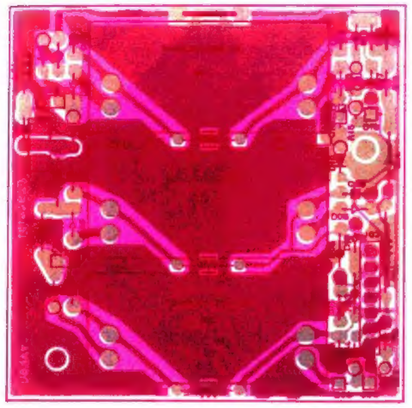
(DC VOLT)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	REMARKS
Q1014	8.4/2.5	8.4/2.5	8.8/2.5	-9.0/-9.0	3.1/2.7	7.0/1.8	-7.6/8.4	8.9/8.9											SQL VR CCW/CW
Q1022	7.0	—	5.4	0	3.1	3.1	3.1												
Q1034	-5.2	0	0	-9.0	0	0	-7.7	8.9											
Q1036	12.0/0.7	0/10.2	4.2/3.9	0/0	4.2/3.9	12.9/2.1	0/10.8	13.1/12.3											KEY UP/DWN (MODE CW, VR13 MIN)
Q1038	0	0	0	4.1	0.2	0.2	0	0.1	13.4	0	0.2	13.0	0	0	12.0	0	0	0	MODE AM, 14MHz
Q1039	0	0	0	0	0	4.7	0	0	0	5.0	0	5.0	0	0	0	5.0			MODE AM, 14MHz
Q1040	0/0	4.8/4.8	0/0	0/0	0/0	0/0	0/4.4	4.5/0	8.9/8.9	0/0	7.6/-1.3	0/7.5	0/0	0/0	0/0	7.7/7.7	7.9/7.9	0/0	MODE USB, RX/TX
Q1041	0	4.6	0	5.0	0	5.0	0	0	0	0	0	0	0	4.8	5.0	5.0			14MHz
Q1042	0	0	0	4.8	0	0	0	0	0	0	0	0	4.9	5.0	5.0	5.0			MODE USB, 14MHz
Q1045	13.5	0.1	-8.2	-9.0	-7.8	13.5	13.5	13.5											

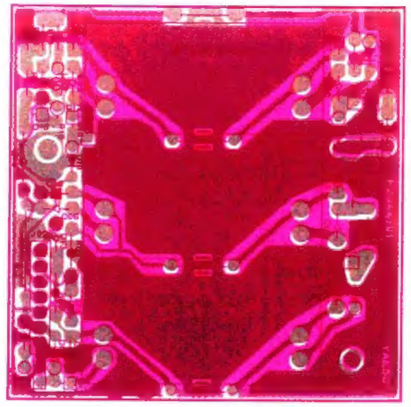
CIRCUIT DIAGRAM



FILTER UNIT PARTS LAYOUT

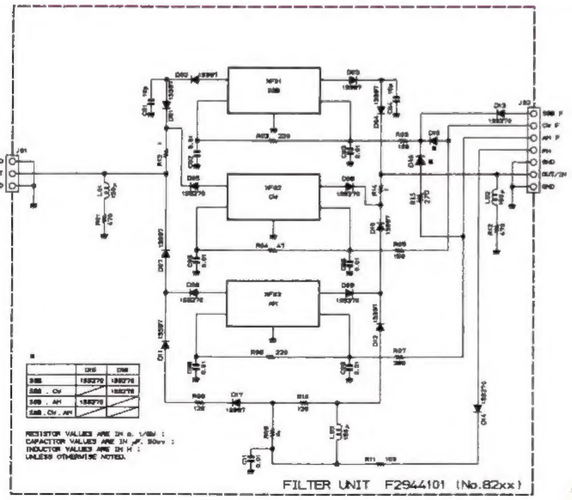


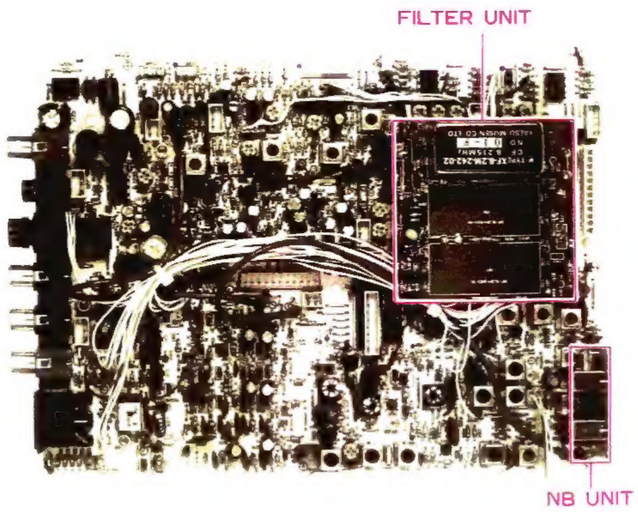
Component side (obverse)



Component side (reverse)

FILTER UNIT CIRCUIT DIAGRAM

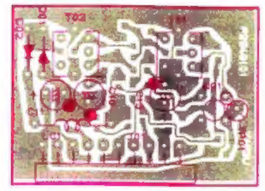




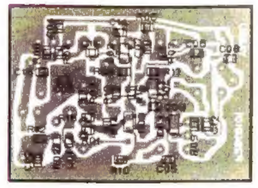
NB UNIT PARTS LAYOUT

Component side (obverse)

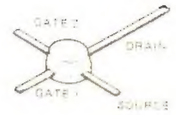
Solder side (obverse)



Component side (reverse)

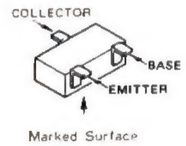


Solder side (reverse)



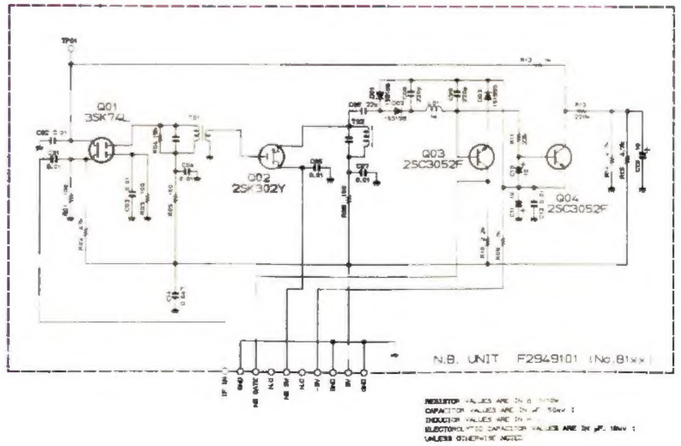
3SK74L
(Q8101)

2SK302Y
(Q8102)



2SC3052F
(Q8103,8104)

NB UNIT CIRCUIT DIAGRAM

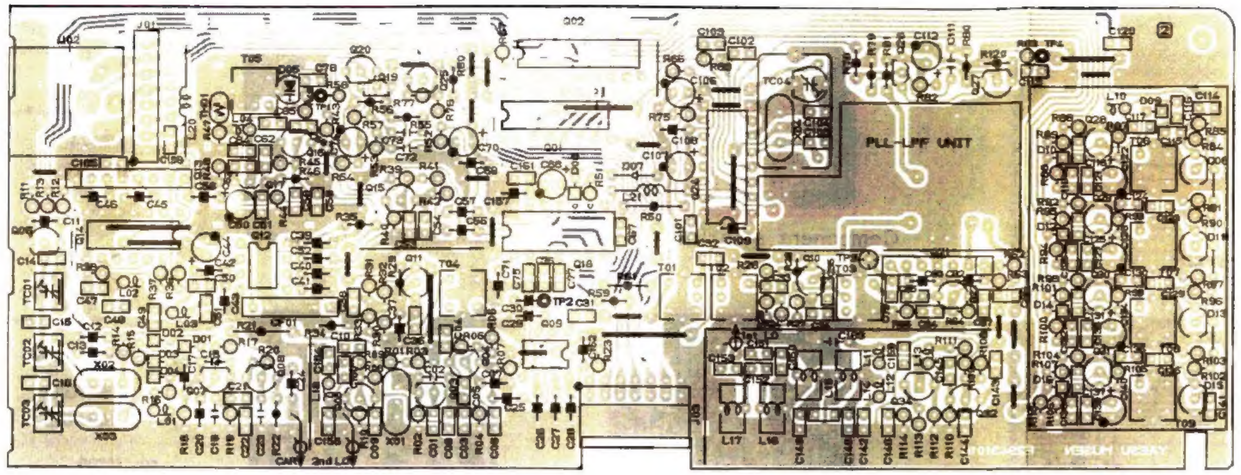


NB UNIT VOLTAGE CHART

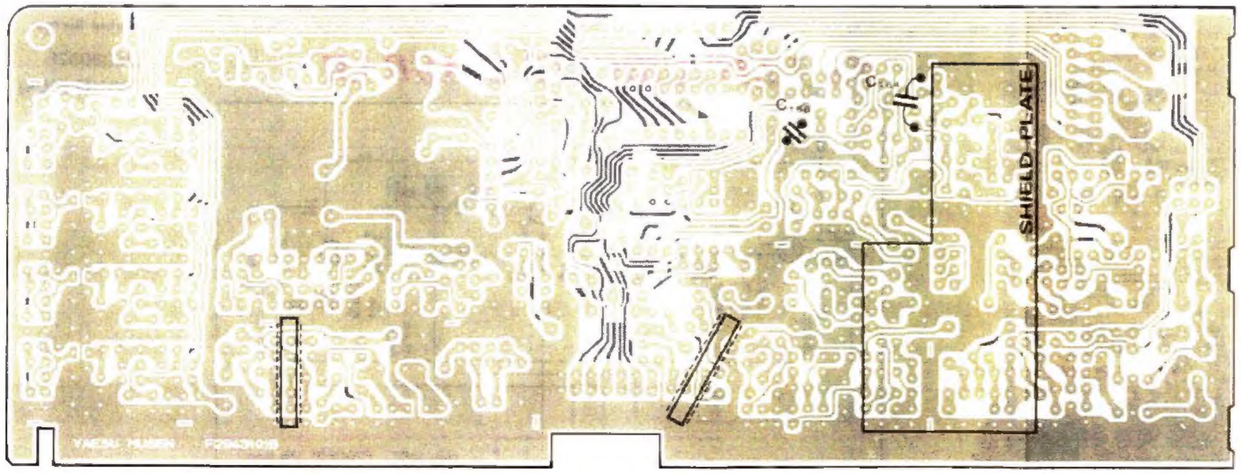
(DC VOLT)

	E (S)	C (D)	B (G_1)	(G_2)	REMARKS
Q8101	7.4	1.5	1.5	4.3	
Q8102	1.7/0	8.9/8.2	0/0		NB OFF/ON
Q8103	-8.8	6.4	-8.9		
Q8104	-9.1	4.3	-9.0		

PARTS LAYOUT



Component side (obverse)

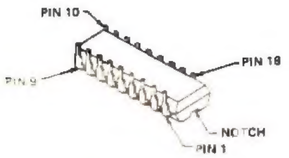


Solder side (obverse)

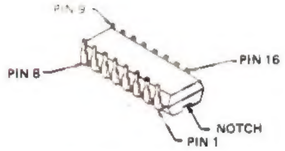
LOCAL UNIT VOLTAGE CHART

(DC VOLT)

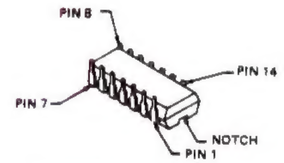
	E (S)	C (D)	B (G)	REMARKS
Q2003	3.1	8.1	3.9	
Q2004	3.5	8.1	4.2	
Q2005	1.4	8.1	2.2	
Q2006	0/0	0.7/0	0/0.7	RX/TX MODE CW
Q2007	2.0	6.6	2.0	MODE USB
Q2008	1.7	8.0	2.4	MODE USB
Q2010	1.8	8.4	2.5	
Q2011	1.9	8.4	2.6	
Q2015	3.6	8.0	4.2	
Q2016	2.3	8.3	2.9	
Q2017	1.0	8.4	0	
Q2019	8.6	0.5	0.6	
Q2020	0	5.6	0.7	
Q2022	2.5	8.3	3.2	
Q2025	0/0	5.0/0	0/0.6	PLL LOCK/UNLOCK
Q2026	0.8	8.6	0.5	14MHz
Q2027	0.1	5.3	0.8	14MHz
Q2028	2.6	7.1	3.3	3.5MHz
Q2029	2.6	7.1	3.3	28MHz
Q2030	2.6	7.1	3.3	18MHz
Q2031	3.1	7.0	3.9	28MHz
Q2032	2.5	8.3	3.3	
Q2034	2.8	8.7	3.5	



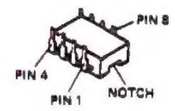
M54564P (Q2002)



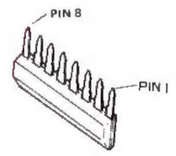
μPD4094BC (Q2001)



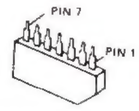
CX-7925B (Q2018,2024)
μPD4013BC (Q2014)



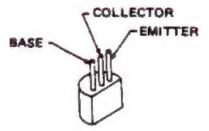
SN16913P (Q2009,2012)



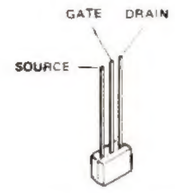
M54459L (Q2013)



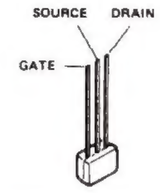
μPC1037H (Q2021)



2SC458C (Q2004~2008, 2010,2011, 2015,2025)
2SC535B (Q2003,2016, 2022,2028-2032)
2SC732TMBL (Q2020,2027)
2SC2053 (Q2034)



2SK184Y (Q2019,2026)

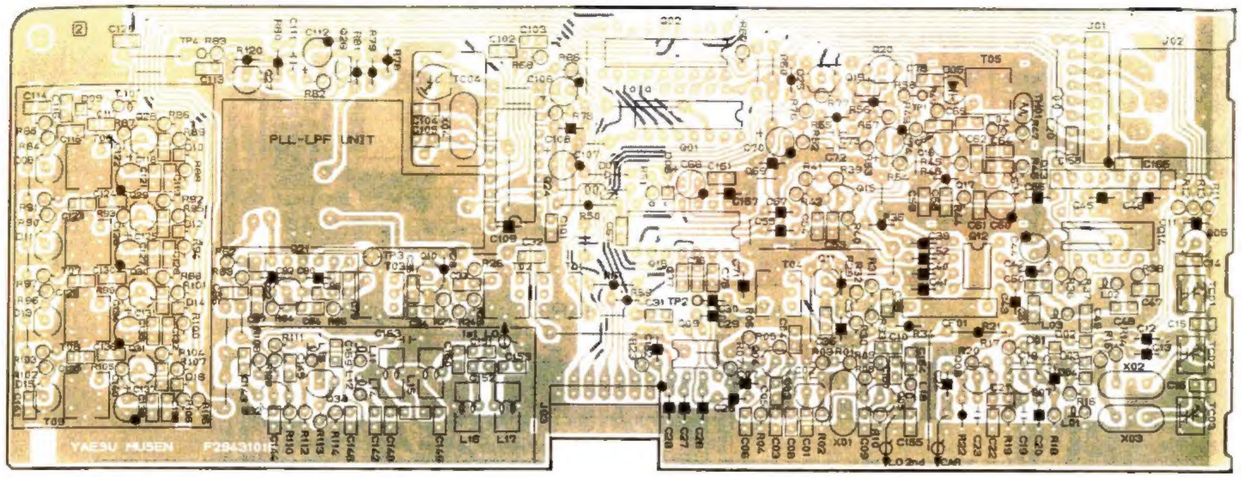


2SK192AGR (Q2017)

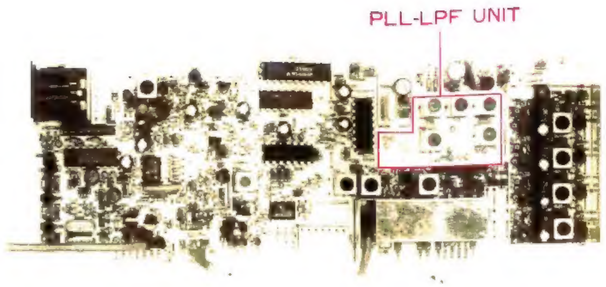
LOCAL UNIT IC VOLTAGE CHART

(DC VOLT)

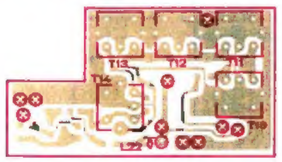
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	REMARKS
Q2001	—	—	—	0	4.8	0	0	0	0	0	0	4.8	0	0	5.0	5.0			14MHz
Q2002	0	0	4.8	0	0	4.8	0	0	8.8	0	0	0	7.6	0	0	7.6	-0.4	0	14MHz, MODE USB
Q2009	6.4	3.8	2.7	0	2.7	3.8	3.8	7.8											14MHz, MODE USB
Q2012	6.4	3.8	2.7	0	2.7	3.8	3.8	7.7											14MHz, MODE USB
Q2013	0	0	4.9	2.6	2.6	0	4.9	2.5											14MHz, MODE USB
Q2014	0	4.9	0	0	0	0	0	0	2.5	0	2.5	2.5	2.3	4.9					14MHz, MODE USB
Q2018	-2.4	—	—	—	2.1	2.2	0.5	0	—	—	2.4	5.0	4.2	0					14MHz, MODE USB
Q2021	5.9	5.2	4.8	0	2.6	2.6	2.6												14MHz, MODE USB
Q2024	-2.4	—	—	—	2.2	1.9	0.5	0	—	—	0.5	4.8	2.0	0					14MHz, MODE USB



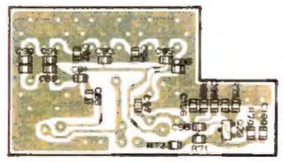
Component side (reverse)



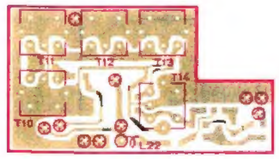
PLL-LPF UNIT PARTS LAYOUT



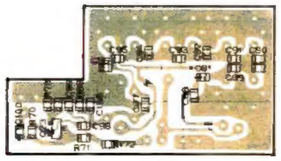
Component side (obverse)



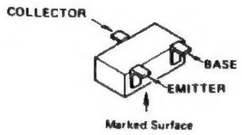
Solder side (obverse)



Component side (reverse)

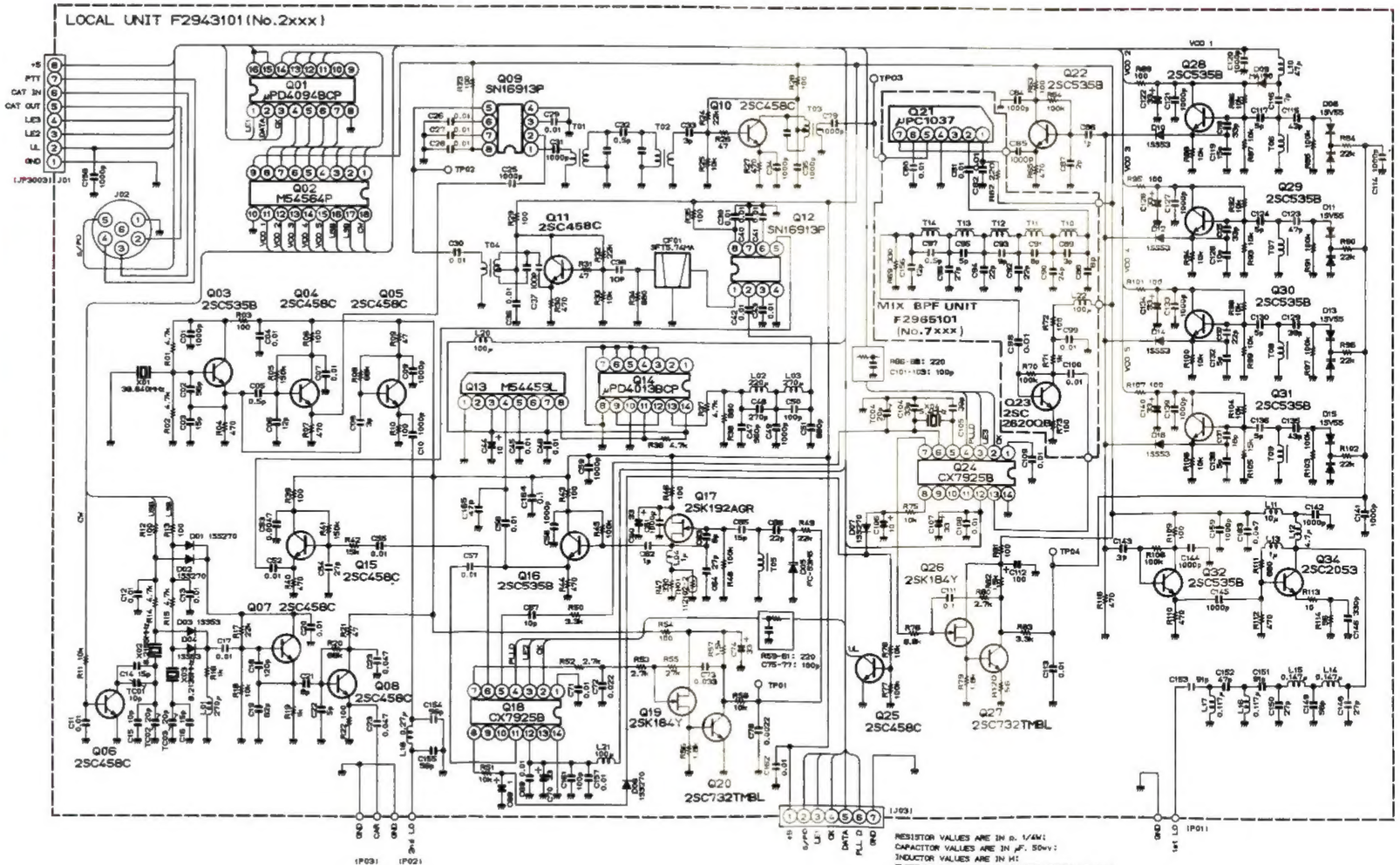


Solder side (reverse)

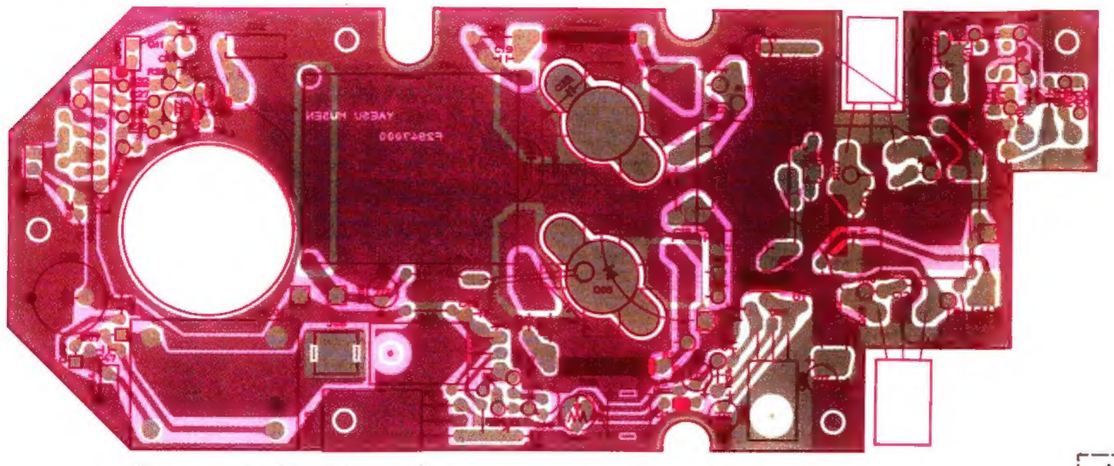


2SC2620QB (Q7023)

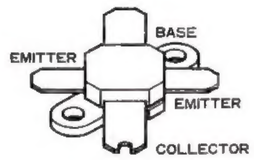
CIRCUIT DIAGRAM



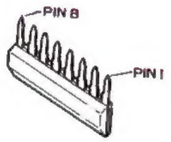
PARTS LAYOUT



Component side (obverse)



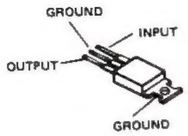
2SC3240 (Q5004,5005)



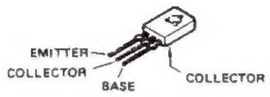
M5218L (Q5010)

2SB824R (Q5008)
2SC2166 (Q5001)

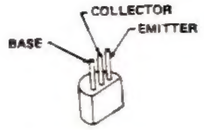
2SC3133 (Q5002,5003)



μPC7808H (Q5006)



2SD882Q (Q5007)



2SC458D (Q5009)
2SC2001 (Q5011)

PA UNIT VOLTAGE CHART

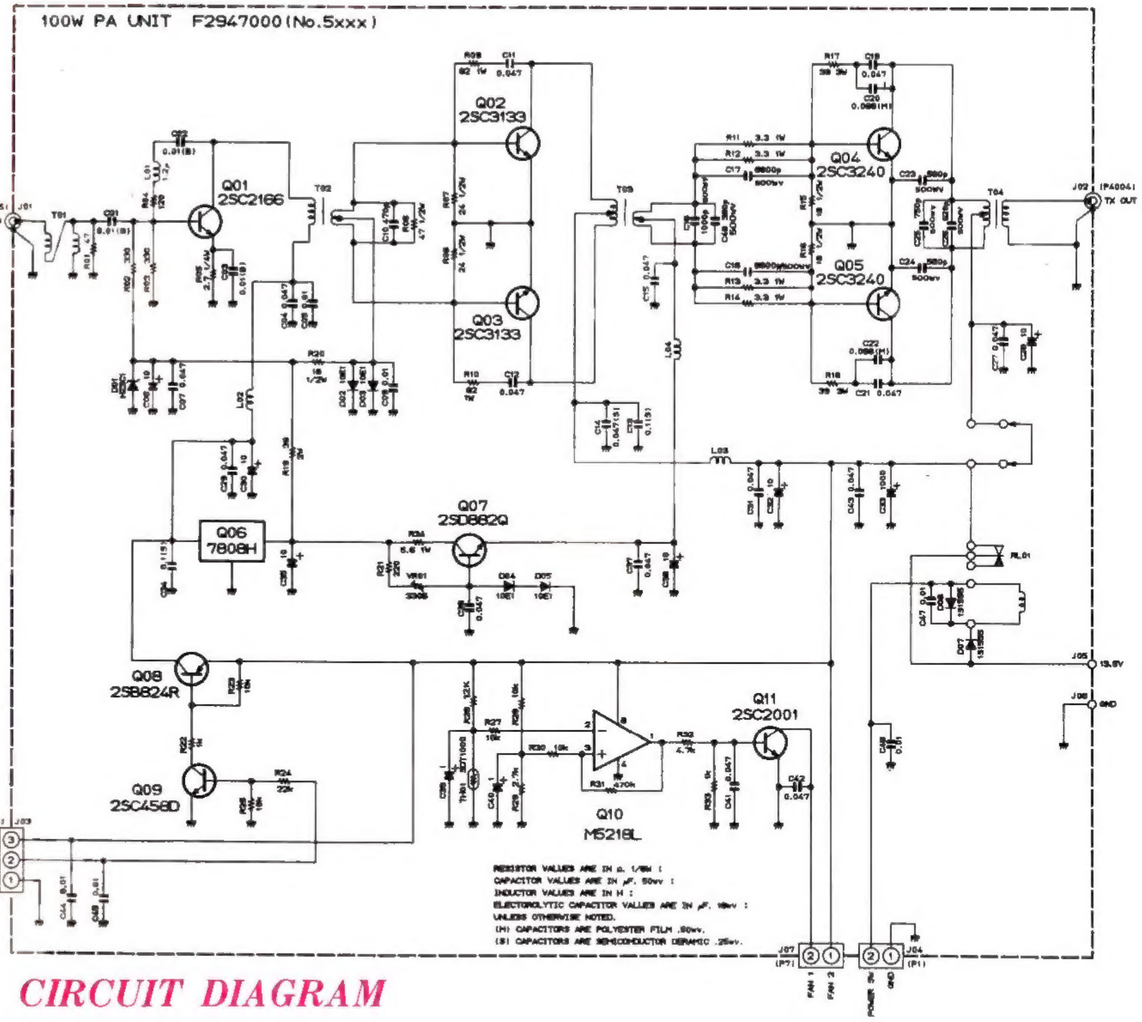
(DC VOLT)

	E	C	B	REMARKS
Q5001	0/0.4	0/13.4	0/1.2	RX/TX
Q5002	0/0	13.5/13.5	0/0.7	RX/TX
Q5003	0/0	13.5/13.5	0/0.7	RX/TX
Q5004	0/0	13.5/13.5	0/0.6	RX/TX
Q5005	0/0	13.5/13.5	0/0.6	RX/TX
Q5007	0.4/1.4	0/7.6	0/0.7	RX/TX
Q5008	13.5/13.5	0.5/13.4	13.5/12.7	RX/TX
Q5009	0/0	13.5/0.1	0/0.7	RX/TX
Q5010	0	13.5	0.2	

PA UNIT IC VOLTAGE CHART

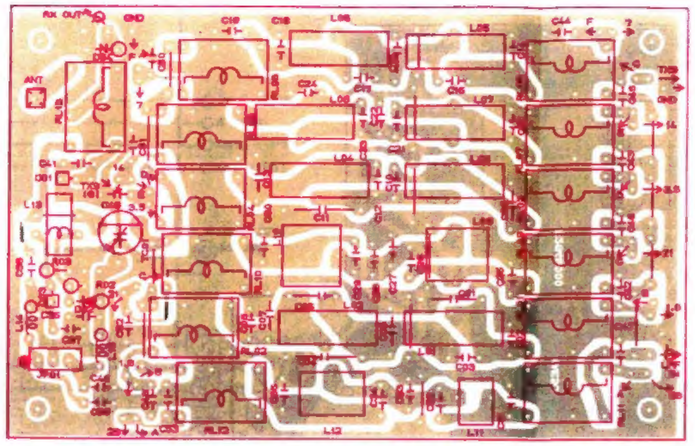
(DC VOLT)

	1 (IN)	2 (GND)	3 (OUT)	4	5	6	7	8	REMARKS
Q5006	0.4/13.4	0/0	0/8.0						RX/TX
Q5010	1.4/1.3	40-70/10-30	2.8/3.1	0/0	—	—	—	13.5/13.5	FAN OFF/ON

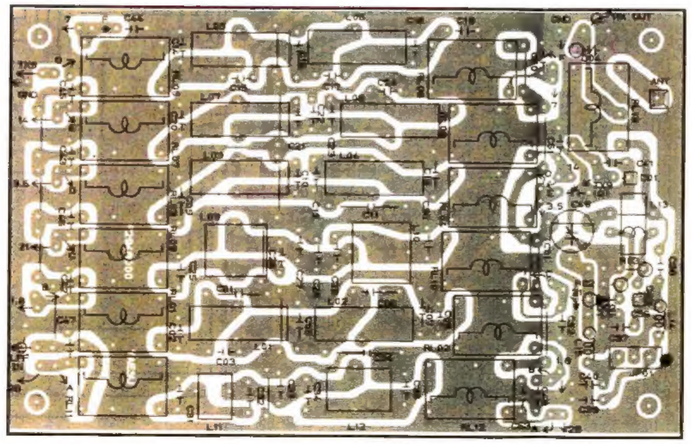


CIRCUIT DIAGRAM

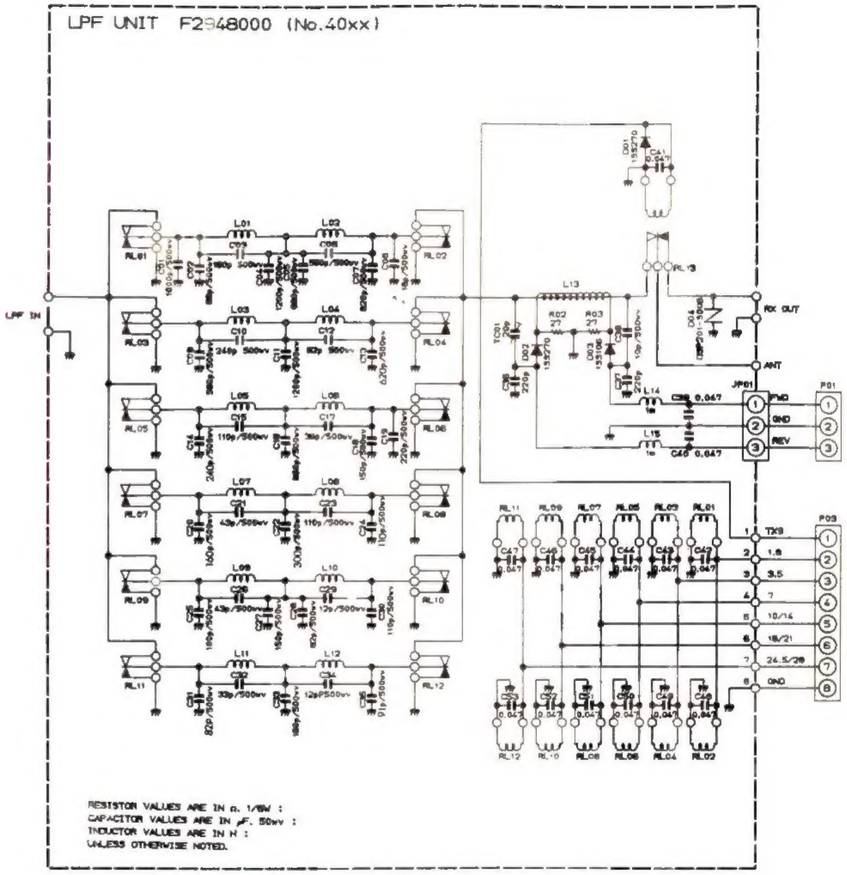
PARTS LAYOUT



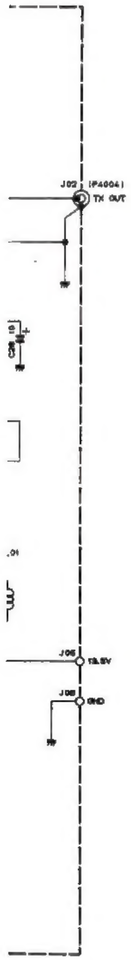
Component side (obverse)



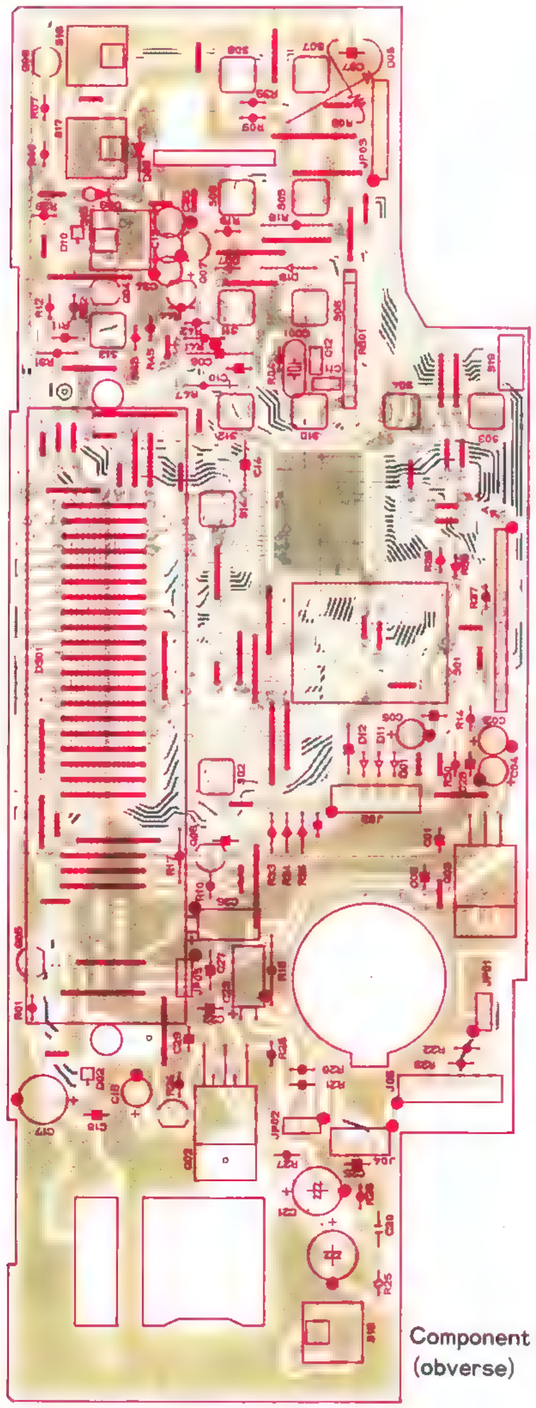
Component side (reverse)



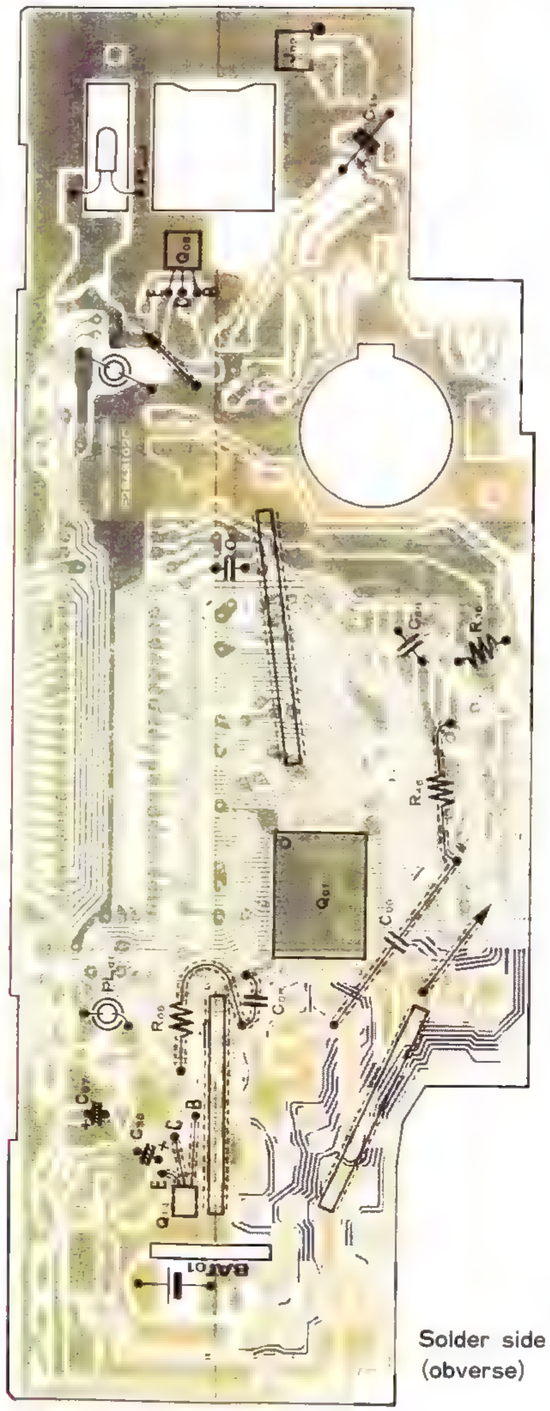
CIRCUIT DIAGRAM



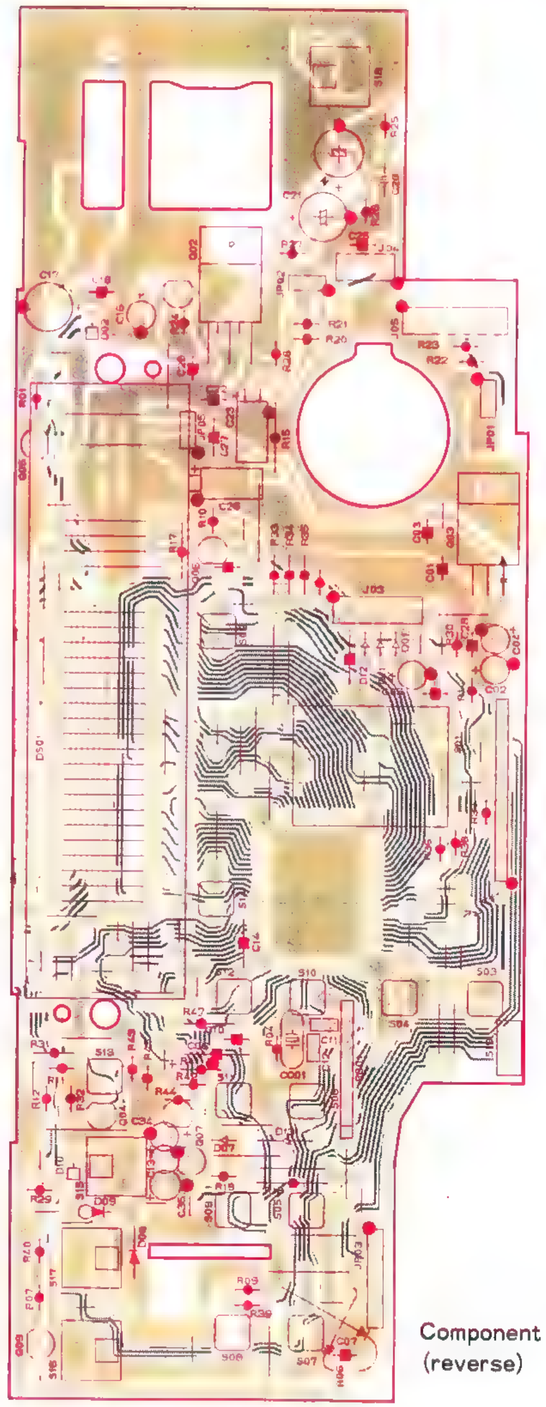
PARTS LAYOUT



Component side
(obverse)

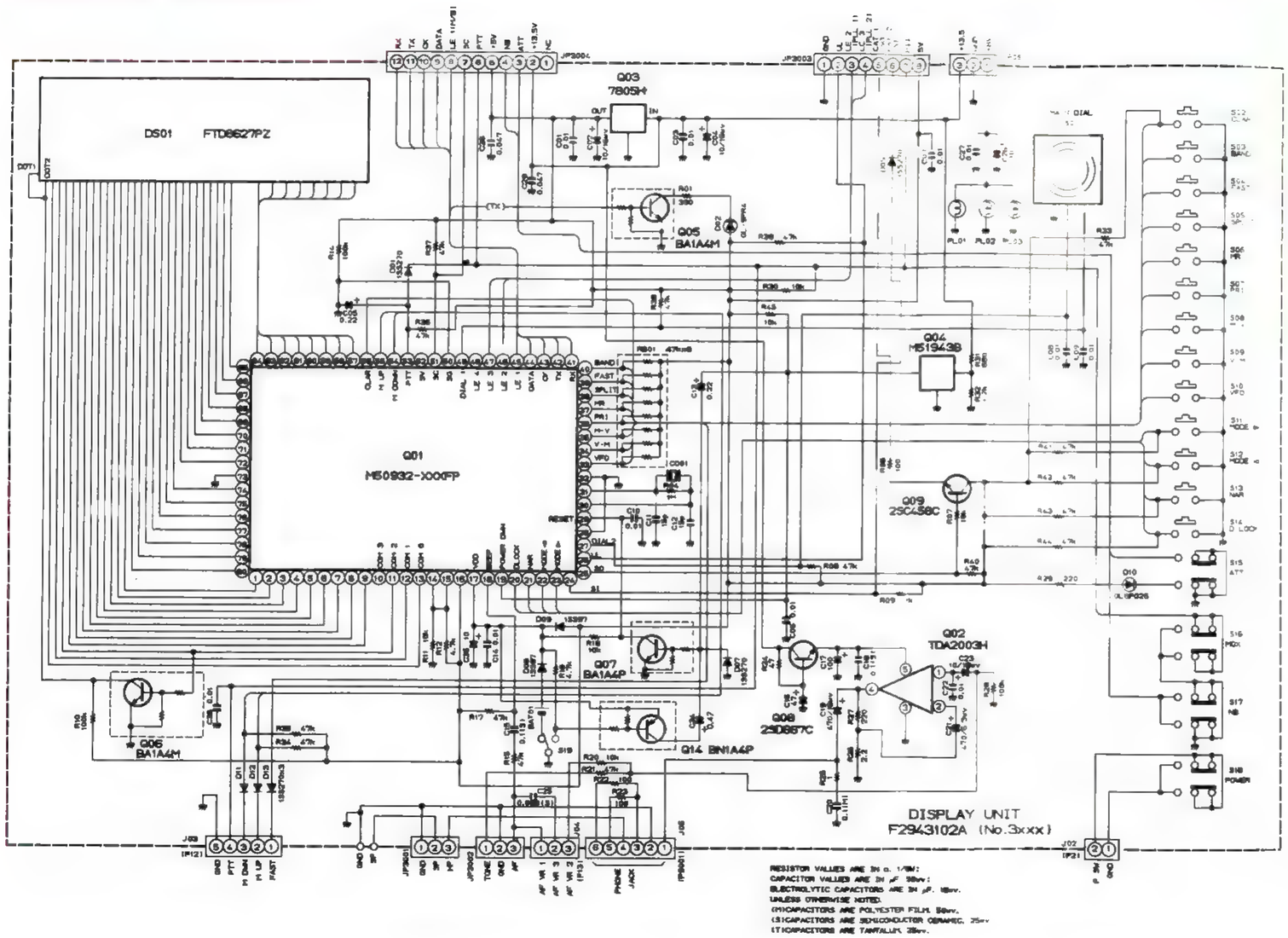


Solder side
(obverse)



Component si
(reverse)

CIRCUIT DIAGRAM



DISPLAY UNIT VOLTAGE CHART

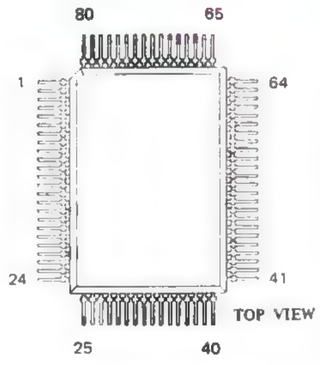
(DC VOLT)

	E	C	B	REMARKS
Q3005	0/0	3.5/0	0/4.5	RX/TX
Q3006	2.7	0.8	0	
Q3007	0	4.6	0	
Q3008	12.7	13.4	13.4	
Q3009	4.2	5.0	4.6	
Q3014	4.6	0	4.0	

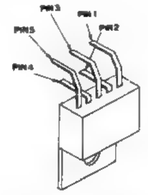
DISPLAY UNIT VOLTAGE CHART

(DC VOLT)

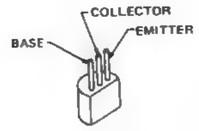
	1 (IN)	2 (GND)	3 (OUT)	4	5	REMARKS
Q3002	0.7	0.1	0	4.8	12.7	
Q3003	13.5	0	5.0			
Q3004	8.3	0	5.0			



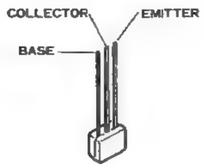
M50932-501FP (Q3001)



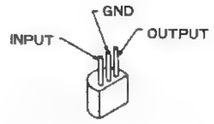
TDA2003H (Q3002)



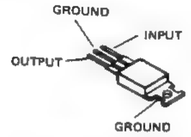
2SC458 (Q3009)
2SD667C (Q3008)



BA1A4M (Q3005,3006)
BA1A4P (Q3007)
BN1A4P (Q3014)

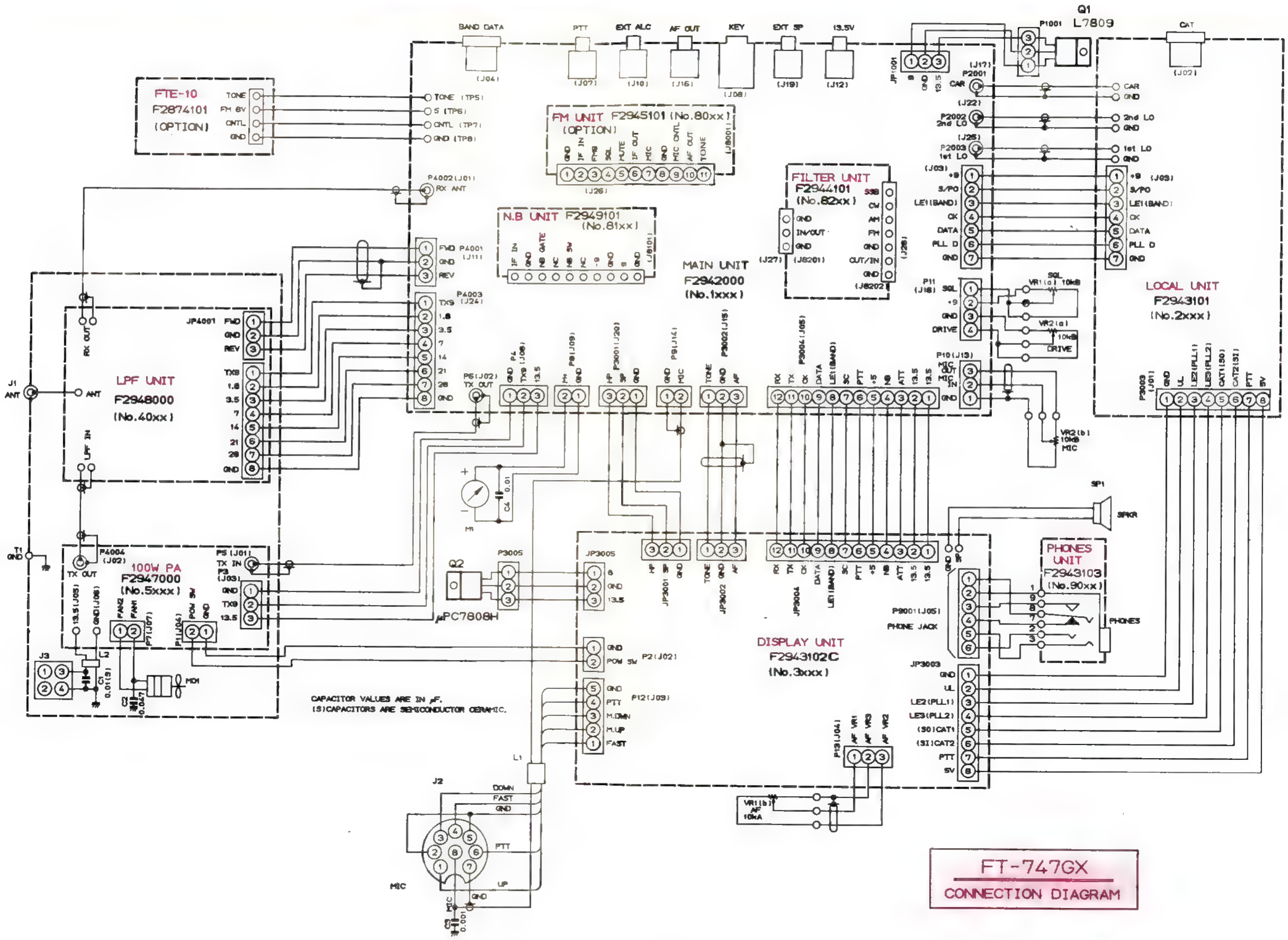


M51943BSL (Q3004)

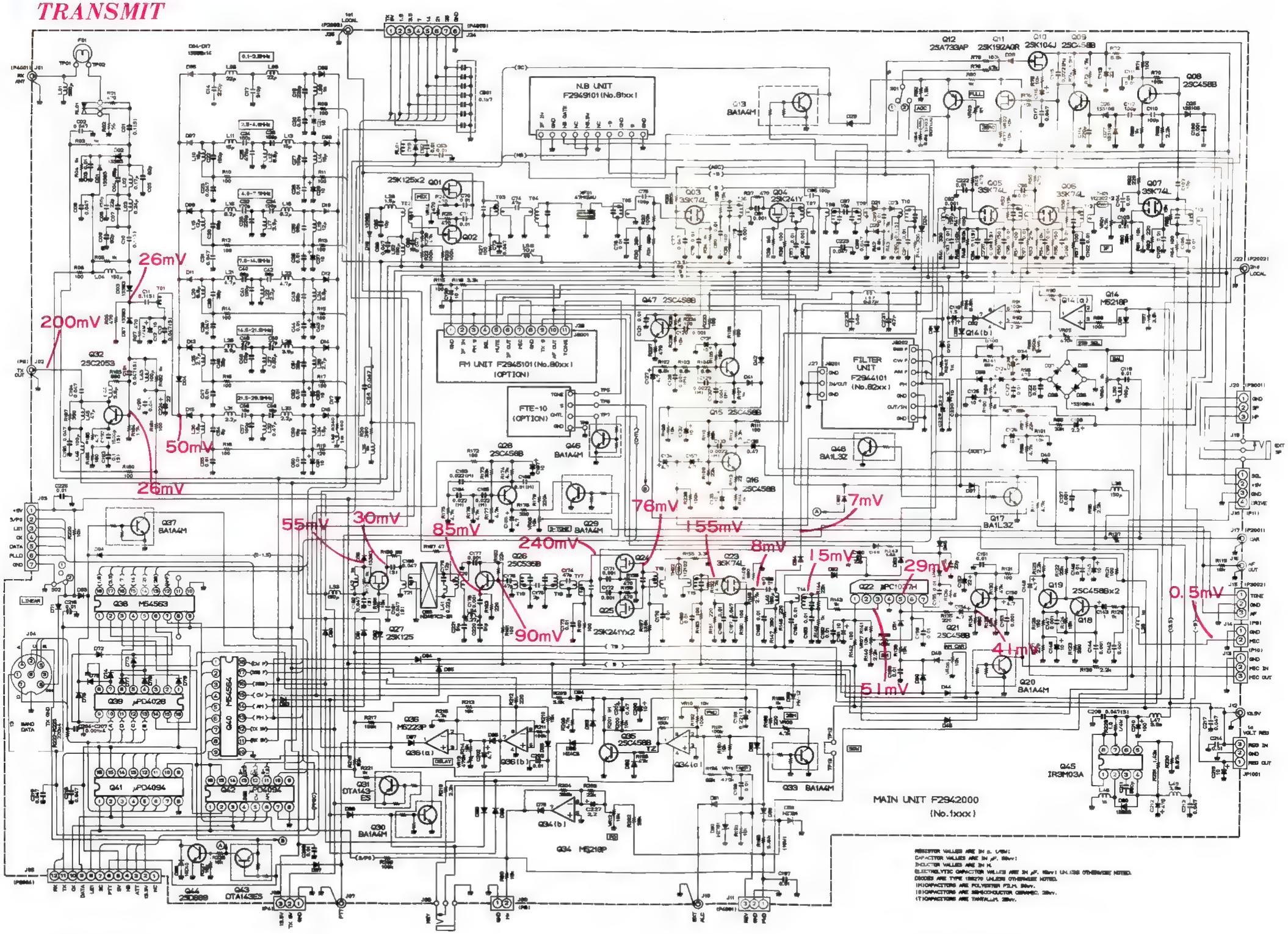


μPC7805H (Q3003)

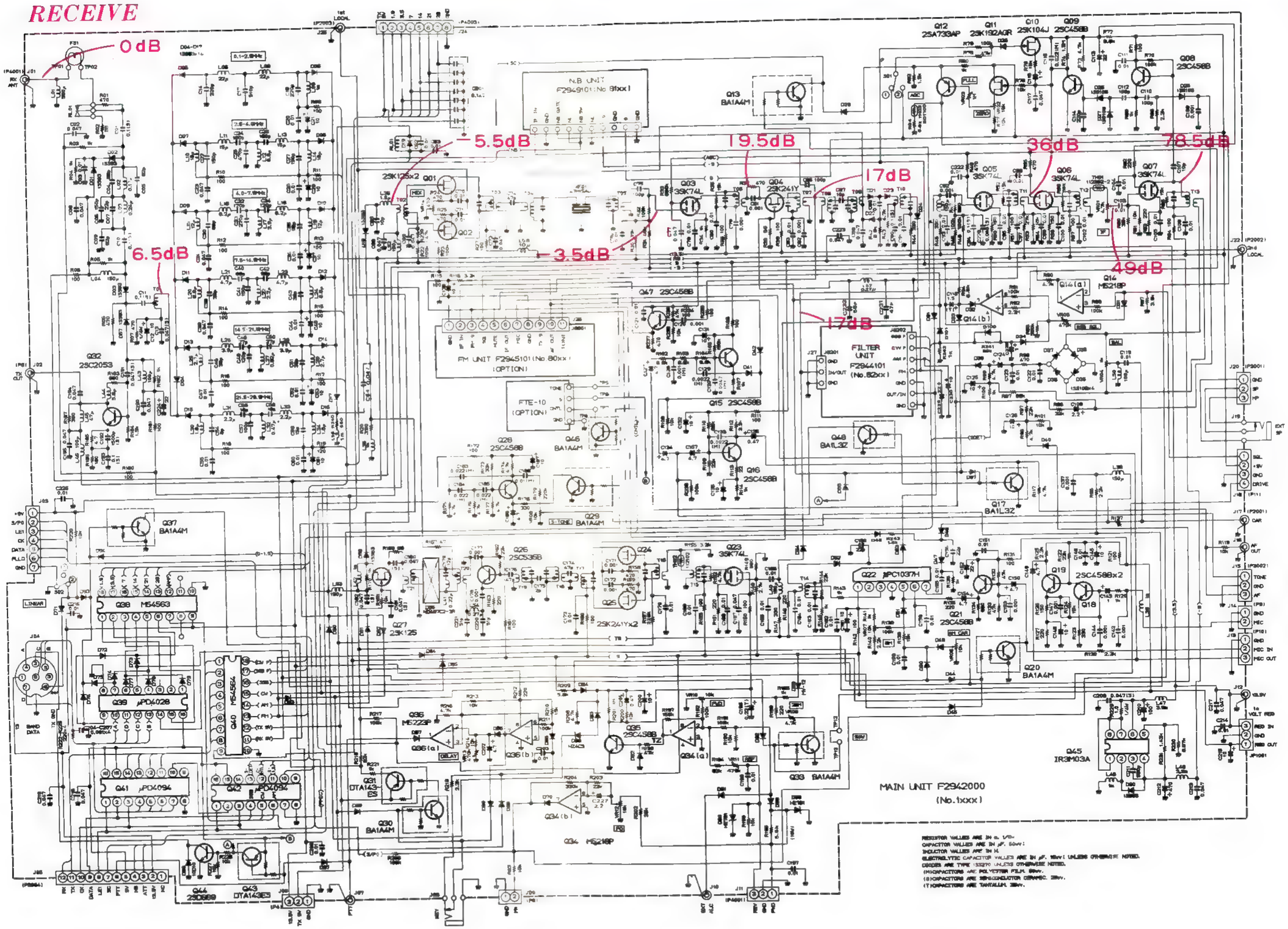
Component side
reverse)



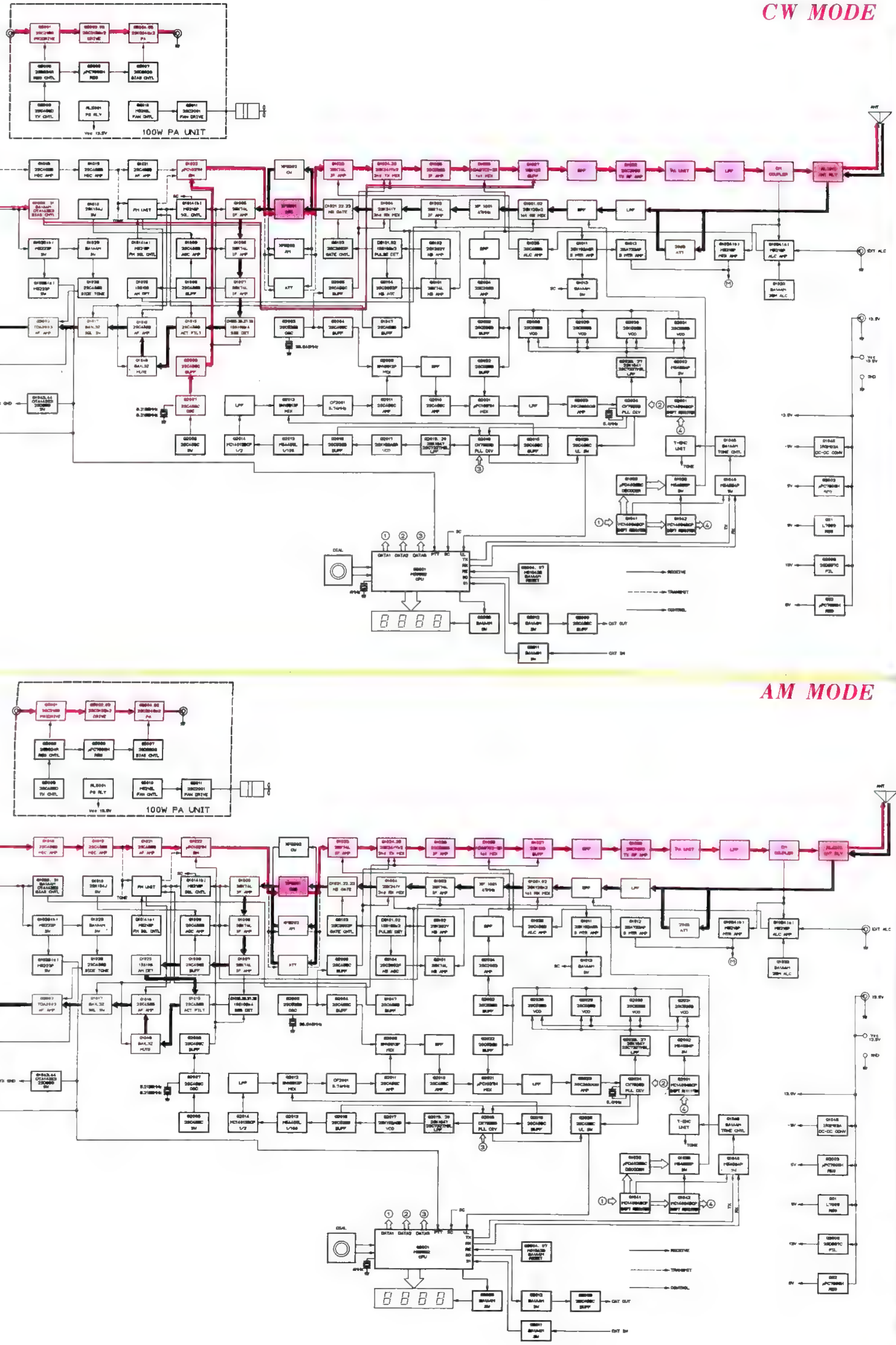
TRANSMIT



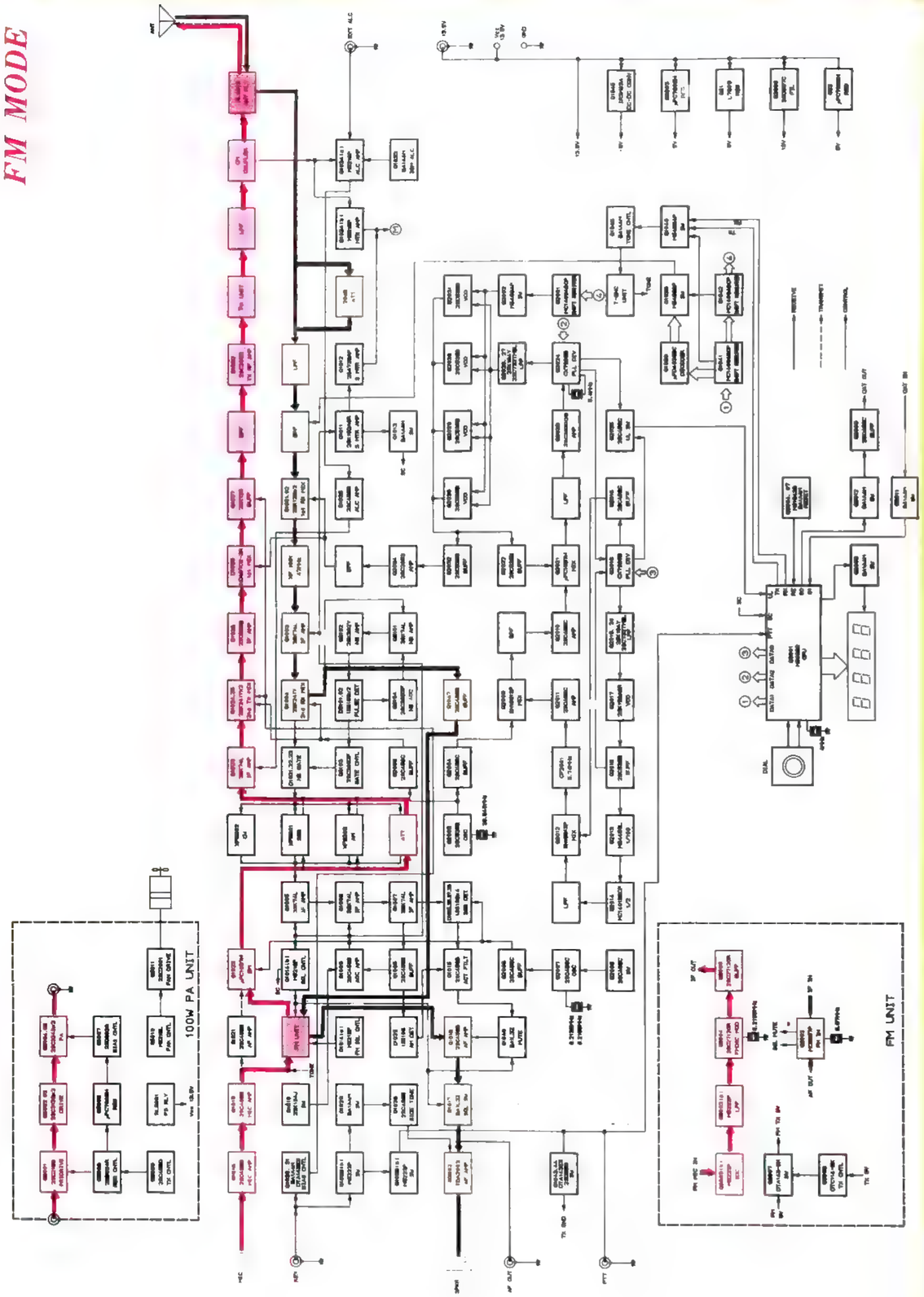
RECEIVE



CW MODE



AM MODE



The FT-747GX is carefully designed to allow the knowledgeable operator to make all adjustments required for various station conditions, modes and operator preferences simply from the controls on the front panel, without opening the case of the transceiver. These adjustments are described in the FT-747GX Operating Manual.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the transceiver has left the factory. However, if damage occurs and some parts subsequently be replaced, realignment may be required. If a sudden problem occurs during normal operation, it is likely due to component failure; realignment should not be done until after the faulty component has been replaced.

We recommend servicing be performed only by authorized Yaesu service technicians who are experienced with the circuitry and fully equipped for repair and alignment. Therefore, if a fault is suspected, contact the dealer from whom the transceiver was purchased for instructions regarding repair. Authorized Yaesu service technicians realign all circuits and make complete performance checks to ensure compliance with factory specifications after replacing any faulty components.

Those who do undertake any alignment are cautioned to proceed at their own risk. Problems caused by unauthorized attempts at realignment are not covered by the warranty policy. Also, Yaesu must reserve the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners.

Under no circumstances should alignment be attempted unless the normal function and operation of the transceiver are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and the need for realignment determined to be absolutely necessary.

The following test equipment (and thorough familiarity with its correct use) is necessary for complete realignment. Correction of problems caused by misalignment resulting from use of improper test equipment is not covered under the warranty policy. While most steps do not require all equipment listed, interactions of some adjustments may require complex adjustments be performed afterwards. Do not attempt to perform only a single step unless it is clearly isolated electrically from all other steps. Rather, have all test equipment ready before beginning, and follow all of the steps in a section in the order they are presented.

A 50-ohm dummy load must be connected to the antenna jack in steps calling for transmission (pressing the MOX button). Correct alignment is not possible with an antenna.

The NAR, ATT and NB buttons should be set to OFF and the SQL control must be fully counterclockwise, unless stated otherwise.

After completing one step, read the following step to determine whether the same test equipment will be required. If not, remove the test equipment (except dummy load and wattmeter, if connected) before proceeding.

Alignment Equipment

Frequency counter with accuracy of 0.1 ppm to 100 MHz

DC voltmeter with at least 10-Megohm input impedance

RF voltmeter with at least 5% accuracy to 100 MHz, high impedance, and ranging from 10 mV to 3 Vrms

AF millivoltmeter

DC milliammeter ranging to 500 mA

RF in-line wattmeter

Resistive dummy load, 50 ohms, 150W; three required for SWR Turndown alignment

RF signal generator covering 1-30 MHz, with calibrated output levels from 5 dBμ to 100 dBμ

AF signal generator with calibrated output levels from 1 mV to 25 mV

RF sampling coupler ("T")

Additional Alignment Precautions

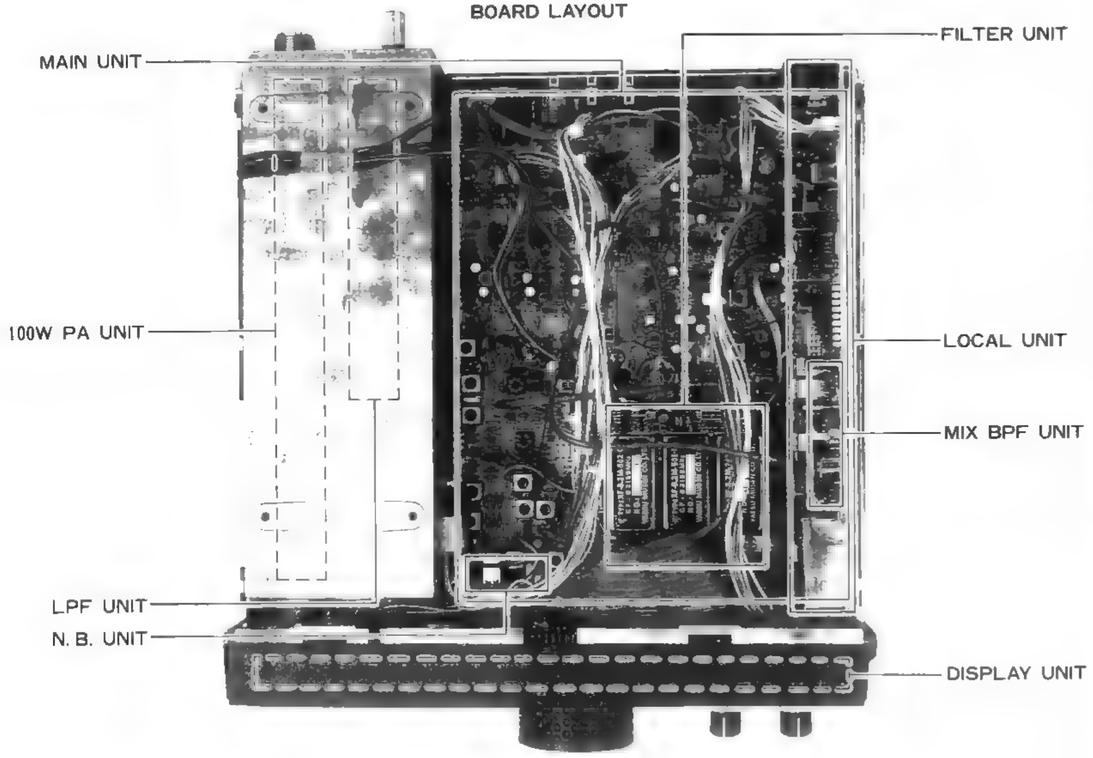
Correct alignment requires that the ambient temperature be the same as that of the transceiver and test equipment, and that this temperature be held constant between 20 and 30 °C (68 to 86 °F). When the transceiver is brought into the shop from hot or cold air it should be allowed some time for thermal equalization before alignment.

Alignments must only be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

Alignment values assume a DC supply voltage of 13.5V DC.

Note: Signal levels in dB referred to in the alignment procedure are based on 0dBu=0.5uV.

BOARD LAYOUT



ALIGNMENT

I. Local Unit

A. 2nd Local Overall Check

1. Disconnect TMP plug P2002 from J1022 on the Main Unit.
2. Connect the frequency counter to P2002 and confirm 38.8380 MHz ±400 Hz on the counter.
3. Remove the counter and connect a 50-ohm resistor and the RF voltmeter to P2002.
4. Confirm at least 230 mVrms on the voltmeter.
5. Disconnect the resistor and voltmeter, and replace P2002 in J1022.

B. PLL Subloop VCO

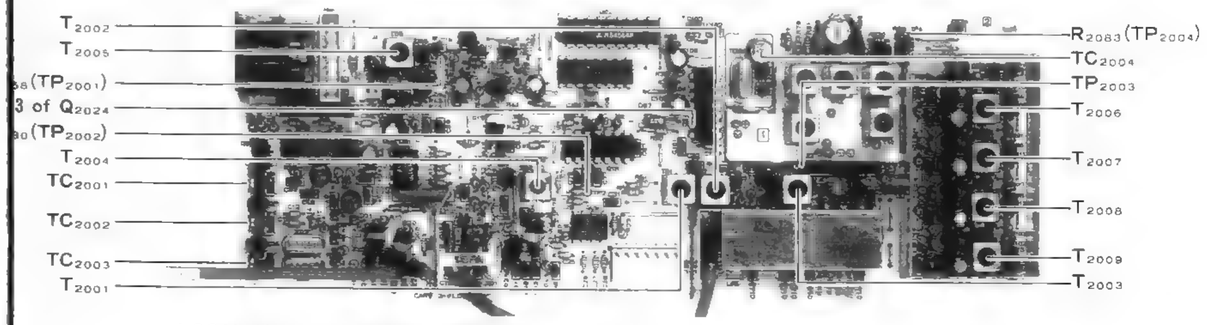
1. Connect the DC voltmeter between the exposed lead of R2058 (TP2001) and chassis ground.
2. Tune the transceiver to 7.0015 MHz, LSB mode.
3. Adjust T2005 for 2.0 ±0.1V on the meter.
4. Retune the transceiver to 7.0014 MHz and confirm at least 5.6 ±0.6V on the voltmeter.
5. Disconnect the voltmeter.

C. PLL Subloop BPF

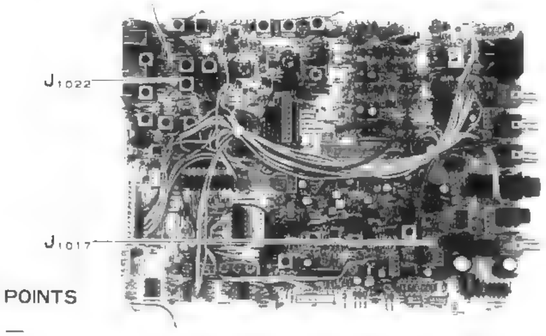
1. Connect the RF voltmeter to the exposed lead of C2030 (TP2002).
2. Tune the transceiver to 7.0265 MHz, LSB mode.
3. Adjust T2004 for peak on the voltmeter (at least 70 mVrms).
4. Move the voltmeter to TP2003, and retune the transceiver to 7.0267 MHz.
5. Adjust T2001-T2003 for peak on the voltmeter (more than 50 mVrms).
6. Disconnect the voltmeter.

D. PLL Main Loop VCO

1. Connect the DC voltmeter between the exposed lead of R2083 (TP2004) and chassis ground.
2. Referring to the following table, tune the transceiver to each adjustment frequency (MHz), adjust the corresponding transformer for 1.5 ±0.1V, retune to the corresponding check frequency and confirm the check voltage on the voltmeter.



LOCAL UNIT ALIGNMENT POINTS



MAIN UNIT ALIGNMENT POINTS

Adjust. Frequency	Adjust. Transformer	Check Freq.	Check Voltage
2.5000	T2006	2.4999	4.5-6.5V
		7.4999	5.0-6.5V
		0.1000	1.5-3.0V
7.5000	T2007	14.4999	5.0-6.5V
14.5000	T2008	21.4999	5.0-6.5V
21.5000	T2009	29.9999	5.0-6.5V

3. Connect the RF voltmeter to pin 13 of Q2024 and tune the transceiver to 29.9999 MHz. Confirm at least 90mVrms on the RF voltmeter.
4. Disconnect the voltmeters.

E. Reference Oscillator
1. Connect the frequency counter to the exposed lead of C2030 (TP2002).
2. Tune the transceiver to 7.0000 MHz, LSB mode.
3. If the TCXO option is installed, adjust the trimmer accessible through the hole in the TCXO housing, if necessary, for 5.7635 MHz ±3 Hz on the counter.
4. If the TCXO option is not installed, adjust TC2004, if necessary, for 5.7635 MHz ±10 Hz on the counter.
5. Remove the counter.

F. Carrier Point
1. Disconnect TMP plug P2001 from J1017 on the Main Unit, and connect the frequency counter to P2001.
2. With the LSB mode selected, adjust TC2003 for 8.2135 MHz ±10 Hz on the counter.
3. Select USB mode and adjust TC2002 for 8.2165 MHz ±10 Hz on the counter.
4. Select CW mode and set the DRIVE control fully counterclockwise (minimum).
5. Press the MOX button to transmit, and adjust TC2001 for 8.2158 MHz ±10 Hz on the counter.
6. Press the MOX button again to return to receive, remove the counter and reconnect P2001 to J1017 (unless performing the next procedure).

G. Carrier Level
1. Disconnect TMP plug P2001 from J1017 on the Main Unit, and connect a 50-ohm resistor in parallel with the RF voltmeter to P2001.
2. Confirm at lease 230 mVrms on the RF voltmeter in all modes.
3. Remove the voltmeter and resistor, and reconnect P2001 to J1017.

II. Main Unit - Receiver

A. RX IF, Part I
1. Connect the RF generator to the antenna jack, and the AF voltmeter and an 8-ohm, 3W resistor across the EXT SPKR jack.
2. Tune the transceiver to 14.2000 MHz, USB mode. Set the AF gain to the 10 o'clock position.
3. Tune the RF generator for a 1.5 kHz heterodyne in the receiver, and adjust the injection level for S-7 on the S-meter.
4. Adjust T1003-T1013 for peak on the AF voltmeter, reducing the injection level, if necessary, to keep S-meter deflection near S-7.
5. Leave the test equipment connected for the next three procedures.

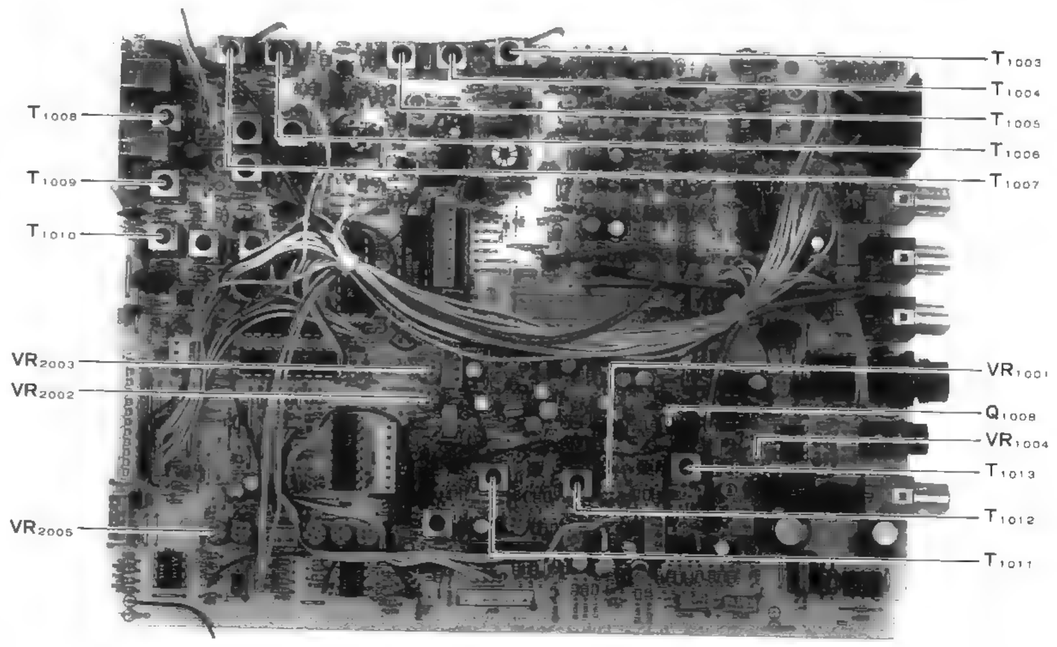
B. S-meter Sensitivity, Part I
1. Connect the RF voltmeter to the emitter of Q1008.
2. Tune the transceiver to 14.0000 MHz, USB mode, and adjust VR1004 for minimum on the voltmeter.
3. Adjust VR1002 so that the S-meter just begins to deflect.
4. Disconnect the voltmeter, and continue with the next procedure.

C. RX IF, Part II
1. Set the transceiver to 14.2000 MHz (USB).
2. Tune the RF generator for a 1.5 kHz heterodyne in the receiver, and adjust the injection level for S-7 on the S-meter.
3. Adjust T1003-T1013 for maximum on the S-meter, reducing the injection level, if necessary, to keep S-meter deflection near S-7.
4. Reduce the injection level to +6dBu and adjust VR1001 for S-1 indication.
5. Perform the next procedure.

D. S-Meter Sensitivity, Part II
Perform the preceeding procedure, if not done already.
1. Set the RF injection level to +100 dBu and adjust VR1003 for S-meter deflection of 60 dB over S-9.
2. Disconnect the test equipment.

E. RX 1st Mixer
1. In LSB mode, tune to the internal heterodyne near 7.1 MHz.
2. Adjust VR1004 for best null of the heterodyne.

F. Noise Squelch
1. Tune to 14.2000 MHz, USB mode, and set the SQL control to the 10 o'clock position.
2. Adjust VR1005 so the squelch just closes when no signal is received.



MAIN UNIT ALIGNMENT POINTS
(Receiver Section)

III. Main Unit, Transmitter

A. TX IF

1. Connect the dummy load and wattmeter to the antenna jack, and tune to 14.2000 MHz, CW mode.
2. Press the MOX button and set the DRIVE control for 50W output.
3. Adjust T1014-T1019 for peak on the wattmeter, reducing the DRIVE, if necessary, to keep power below 60W output.
4. Press the MOX button again to return to receive.

B. ALC & PO Meter Sensitivity

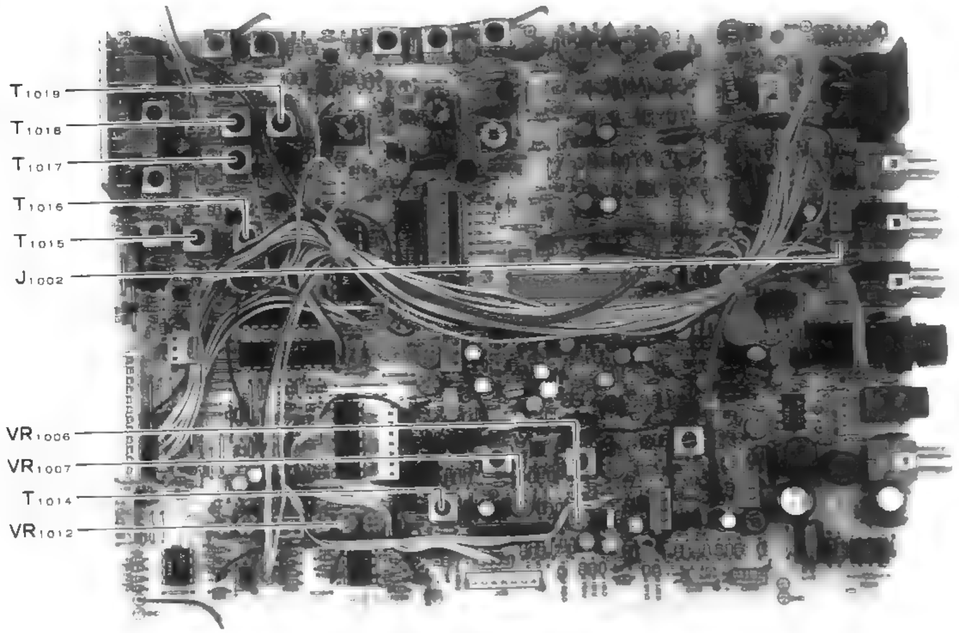
1. With the dummy load and wattmeter connected to the antenna jack, and tuned to 14.2000 MHz, CW mode, set the DRIVE control fully clockwise.
2. Press the MOX button and adjust VR1010 for 100W output, and then VR1012 for S-meter deflection to "8" on the PO scale, repeating both adjustments alternately several times.

C. SSB Carrier Balance

1. With the dummy load and wattmeter connected to the antenna jack, and tuned to 14.2000 MHz, CW mode, set the MIC gain fully counterclockwise.
2. Connect the RF voltmeter to J1002.
3. Press the MOX button and adjust VR1007 for minimum on the voltmeter.
4. Press the MOX button again to return to receive, and disconnect the voltmeter.

D. AM Carrier Level

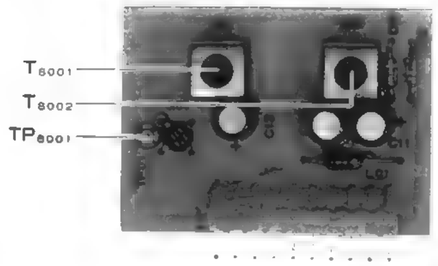
1. With the dummy load and wattmeter connected to the antenna jack, and tuned to 14.2000 MHz, AM mode, set the MIC gain fully counterclockwise.
2. Preset VR1006 fully clockwise.
3. Press the MOX button and set the DRIVE control for 80W output.
4. Adjust VR1006 for 20W output.
5. Press the MOX button again to return to receive, and remove the test equipment.



MAIN UNIT ALIGNMENT POINTS
(Transmitter Section)

IV. Noise Blanker Unit

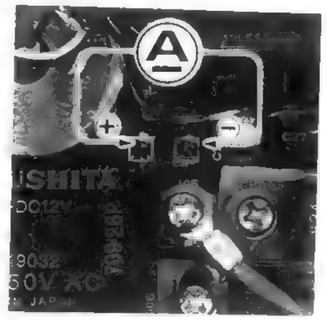
1. Connect the RF generator to the antenna jack, and the DC voltmeter between TP8001 and chassis ground.
2. Tune the transceiver and RF generator to 14.2000 MHz, and inject 40 dBu with no modulation.
3. Press the NB switch and select the USB mode.
4. Adjust T8001 and T8002 for minimum deflection on the voltmeter.
5. Disconnect the test equipment.

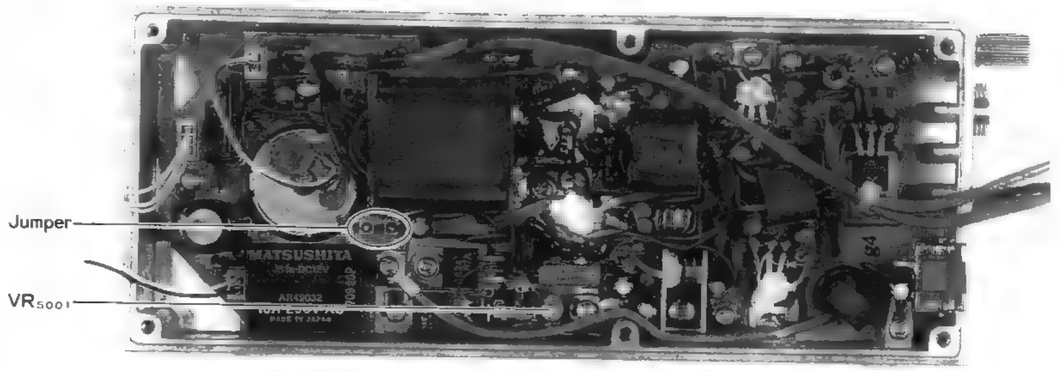


NB UNIT ALIGNMENT POINTS

V. 100W PA Unit (Idling Current)

1. Temporarily remove the jumper indicated below, and connect the DC milliammeter (set to 500 mA range) in its place.
2. Set the transceiver to USB mode, and set the MIC gain fully counterclockwise.
3. Press the MOX button and adjust VR5001 for 200 ±50 mA on the milliammeter.
4. Press the MOX button again to return to receive, remove the milliammeter and reinstall the jumper.





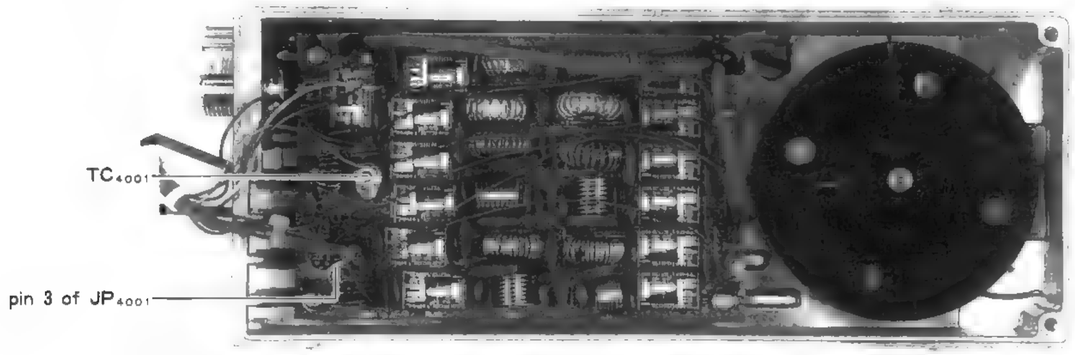
100W PA UNIT ALIGNMENT POINTS

VI. LPF Unit (CM Coupler Balance)

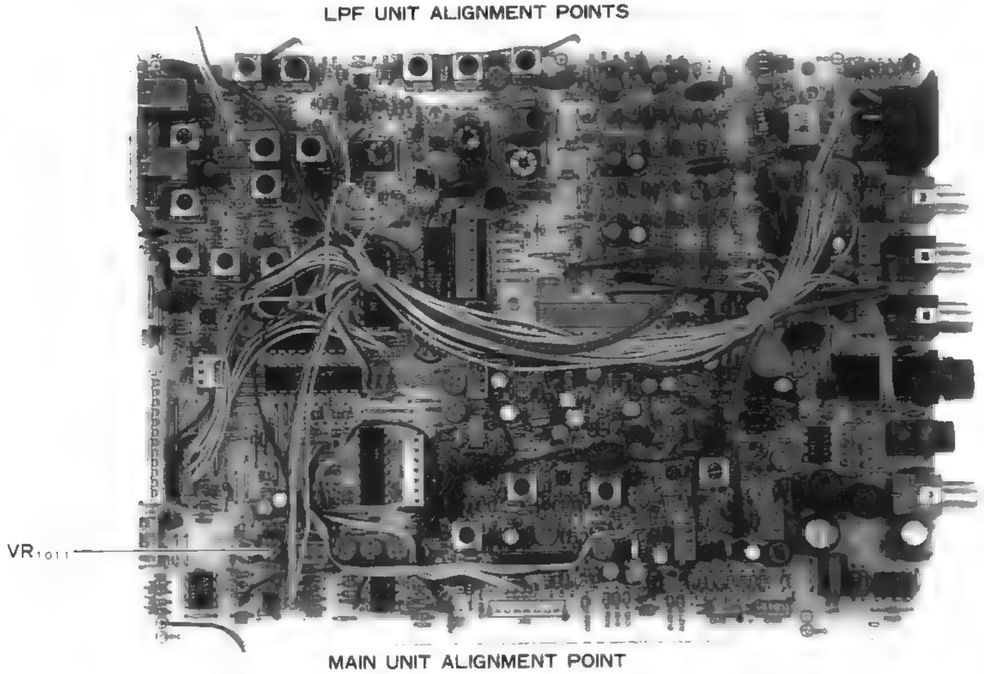
1. Connect the dummy load to the antenna jack, and the DC voltmeter between pin 3 of JP4001 and chassis ground.
2. Tune to 14.2000 MHz, CW mode, and set the DRIVE control fully clockwise.
3. Press the MOX button and adjust TC4001 for minimum deflection on the voltmeter.
4. Press the MOX button again to return to receive, and remove the test equipment.

VII. Main Unit (AFP - Automatic Final Protection)

1. Connect the wattmeter and 16.7-ohm dummy load (three 50-ohm loads in parallel) to the antenna jack.
2. With the transceiver tuned to 14.2000 MHz, CW mode, set the DRIVE control fully clockwise.
3. Press the MOX button and adjust VR1011 for 75W output.
4. Press the MOX button again to return to receive, and disconnect the test equipment.



LPF UNIT ALIGNMENT POINTS



MAIN UNIT ALIGNMENT POINT
(AFP Section)

MAIN CHASSIS

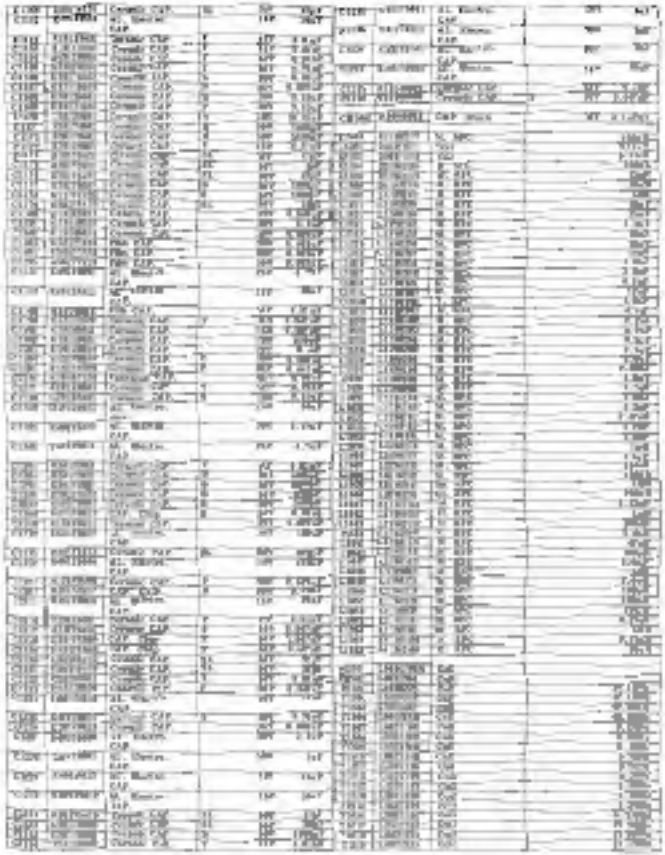
Symbol No.	Part No.	Description	Device
Q1	G1090778	IC	L7809
Q2	G1090294	IC	uPC7808H
VR1	J6280097	Potentiometer	10KA/10kB (AF/SQL)
VR2	J6280098	Potentiometer	10kB/10kB(MIC/DRIVE)
C1	K19149025	Ceramic CAP.	50WV 0.1uF
C2	K13179009	Ceramic CAP. ▲	F 50WV 0.047uF
C3	K10176102	Ceramic CAP.	B 50WV 0.001uF
C4	K13179008	Ceramic CAP.	F 50WV 0.01uF
C5	K19149025	Ceramic CAP.	50WV 0.1uF
L1	L9190010	Ferrite Beads	
L2	L9190047	Ferrite Beads	
SP1	M4090030	Speaker	1.5W 8 ohm
J1	P1090194	Connector (ANT)	
J2	P0090158	Connector (MIC)	
J3	P0090026	Connector (13.8V DC)	
	Q9000078	Terminal	
	Q9000192	Sarcon	
	Q9000125	Insulator	
	T9205617	Wire ASSY	P1-P2
	T9205618	Wire ASSY	P3-P4
	T9315504	Wire ASSY	P5-P6
	T9205619	Wire ASSY ▲	P7
	T9205620	Wire ASSY	P8
	T9205621	Wire ASSY	P9
	T9205622	Wire ASSY	P10
	T9205623A	Wire ASSY	P11
	T9205624A	Wire ASSY	P12
	T9205625	Wire ASSY	P13
	T9311301B	Wire ASSY	P14
	T9317811	Wire ASSY	P15
	T9317825	Wire ASSY	
	R3510940A	Panel	
	R3123790	Filter	
	R3123800	Knob (MAIN)	
	R3123830	Knob (AF,MIC)	
	R6123840	Knob (SQL,DRIVE)	
	R3123850A	Knob (CLAR)	
	R3123870A	Knob (D LOCK)	
	R3123890	Knob (MODE)	
	R3123910	Knob (VFO MR)	
	R3123930	Knob (VFO M)	
	R3123950	Knob (M VFO)	
	R3123960	Knob (SPLIT)	
	R3123980	Knob (PRIM)	
	R3123990	Knob (FAST)	
	R3124020A	Knob (POWER)	
	R3124030B	Knob (NAR)	
	R3124040A	Knob (ATT)	
	R3124050A	Knob (NB,MOX)	
	R3124190	Ring	
	R3804450A	Case Top	
	R3804460A	Case Bottom	
	R5510950A	Side Trim	
	R0510960	Heatsink Cover	
	R0510970A	Heatsink Cover	
	R4804670A	Heatsink	
	R0124060	Fitting	
	R3124010	Knob	
	R5510951	Side Trim	
	R3124800		
	R7049015	SP Net	
	R3100700	Foot	
	R0100690A	Stand	
	R7125160	Sponge	
	R7125170	Sponge	
	R7125230	Press Board	
	R7125430	Sponge	
	R7125450	Sponge	
	R7125460	Sponge	
	R7125630	Sponge	
	R6125640A	Washer	
	R8013580	Name Plate	
	R0116420	Ground Lug	
	R7125830	Sheet	
	R7125850	Press Board	
	R0125890	Fitting	
	R7125900	Sponge	
	R0126000	Clamp	
	R7125631	Sponge Rubber	
	R3126040	Rubber Foot	
	R7126140	Plate	
	R7126150	Plate	
	R6100980A	Nut	
	R7126400	Plate	
	R7126410	Fiber	
	R7126640	Sheet	
	R8124070	Nameplate "FT-747SX" •	
	R8124090	Nameplate "FT-747GX" ▲	
	R0124080A	Motor Holder	
	R3056970B	Radial Fan	
	M2190004	Motor MDN-7R1	DC13.5V
	T9205619	Wire ASSY	

MAIN UNIT

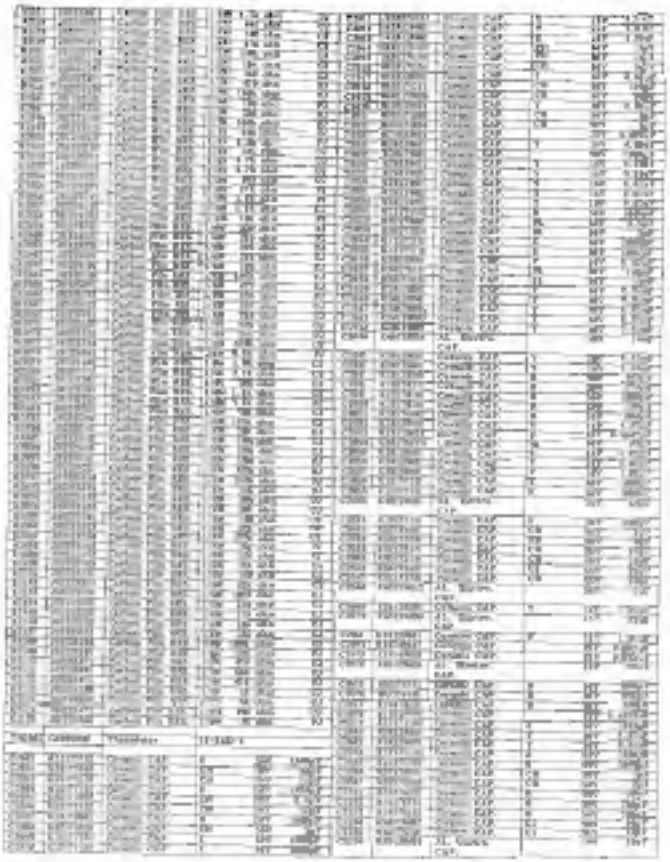
Symbol No.	Part No.	Description	Device
	F2942000A	Printed Circuit Board	
	C029420AA	PCB with Components (10W: Version F)	
	C029420AB	PCB with Components (100W: Version F)	
	C029420AC	PCB with Components	
	C029420AD	PCB with Components w/o NB UNIT (10W: Version F)	
	C029420AE	PCB with Components w/o NB UNIT (100W: Version F)	
	C029420AF	PCB with Components w/o NB UNIT	
Q1001	G3801250	FET	2SK125
Q1002	G3801250	FET	2SK125
Q1003	G4800740L	FET	3SK74L
Q1004	G3802410Y	FET	2SK241Y
Q1005	G4800740L	FET	3SK74L
Q1006	G4800740L	FET	3SK74L
Q1007	G4800740L	FET	3SK74L
Q1008	G3304580B	Transistor	2SC458B
Q1009	G3304580B	Transistor	2SC458B
Q1010	G3801040J	FET	2SK104J
Q1011	G3801921G	FET	2SK192AGR
Q1012	G3107331P	Transistor	2SA733AP
Q1013	G3090074	Transistor	BA1A4M
Q1014	G1090633	IC	M5218P
Q1015	G3304580B	Transistor	2SC458B
Q1016	G3304580B	Transistor	2SC458B
Q1017	G3090077	Transistor	BA1L3Z
Q1018	G3304580B	Transistor	2SC458B
Q1019	G3304580B	Transistor	2SC458B
Q1020	G3090074	Transistor	BA1A4M
Q1021	G3304580B	Transistor	2SC458B
Q1022	G1090101	IC	uPC1037H
Q1023	G4800740L	FET	3SK74L
Q1024	G3802410Y	FET	2SK241Y
Q1025	G3802410Y	FET	2SK241Y
Q1026	G3305350B	Transistor	2SC535B
Q1027	G3801250	FET	2SK125
Q1028	G3304580B	Transistor	2SC458B
Q1029	G3090074	Transistor	BA1A4M
Q1030	G3090074	Transistor	BA1A4M
Q1031	G3090078	Transistor	DTA143ES
Q1032	G3320530	Transistor	2SC2053
Q1033	G3090074	Transistor	BA1A4M
Q1034	G1090633	IC	M5218P
Q1035	G3304584B	Transistor	2SC458BTZ
Q1036	G1090749	IC	M5223P
Q1037	G3090074	Transistor	BA1A4M
Q1038	G1090721	IC	M54563P
Q1039	G1090657	IC	uPD4028BC
Q1040	G1090836	IC	M54564P

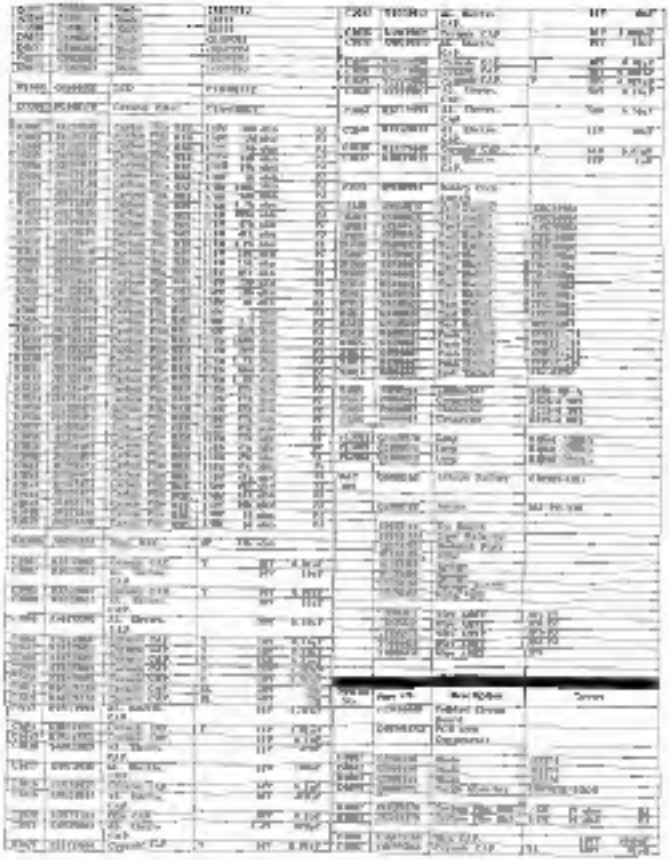
• 10W Type
▲ 100W Type

PARTS LIST



PARTS LIST





PARTS LIST